THE GARDEN JOURNAL

THE NEW YORK BOTANICAL GARDEN

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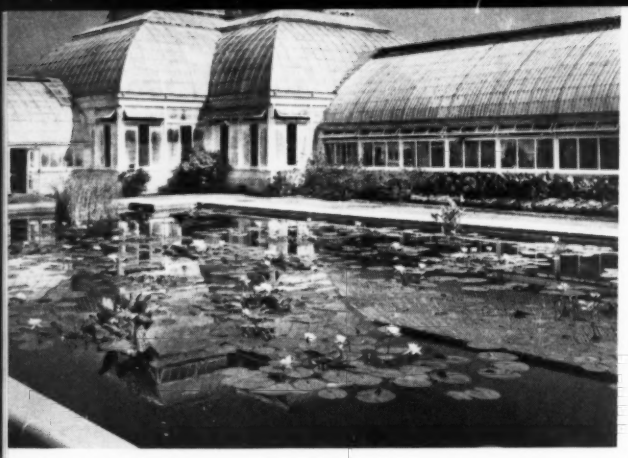

THE GARDEN JOURNAL

THE NEW YORK BOTANICAL GARDEN

DOROTHY EBEL HANSELL
Editor

CALENDAR

September 5-9, 1961. Garden Holiday at Lake Mohonk House, Mohonk Lake, New York.

September 15-17, 1961. Penn-Jersey District Meeting and Rose Show at the Hotel Suburban and the Colonial Life Insurance Company Building, Prospect Street, East Orange, New Jersey.

October 25-27, 1961. Sixteenth Annual American Horticultural Congress, Northampton, Mass.

December 7, 1961. Holiday House Tour, sponsored by the Volunteer Associates of The New York Botanical Garden.

December 14, 1961. Theater Benefit, "Gay Life" at the Shubert Theater, sponsored by the Volunteer Associates of The New York Botanical Garden.

January 4, 11, 18, 25, 1962. Downtown Lecture Series, sponsored by the Volunteer Associates of The New York Botanical Garden.

April 27-May 7, 1962. Floralies, International Horticultural Exposition under auspices of Société d' Horticulture and Jardin Populaires de France in Valenciennes, France.

August 31-September 8, 1962. Sixteenth International Horticultural Congress, Brussels, Belgium.

April 26-October 1, 1963. International Horticultural Exposition, Hamburg, West Germany.

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While every effort is made by the Editor to avoid errors, the ultimate responsibility for all statements rests with the authors.

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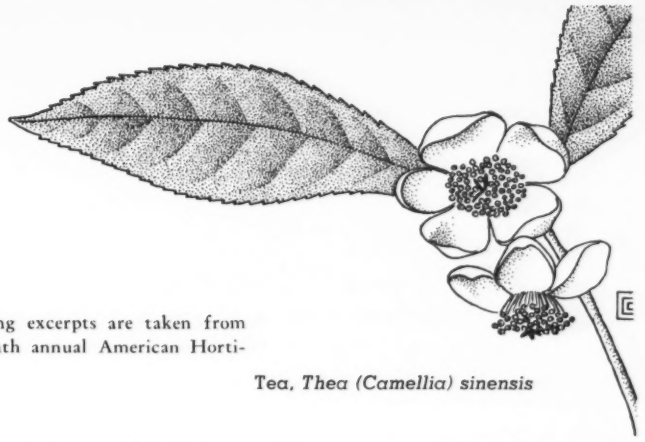
HISTORICAL NOTES ON THE CAMELLIA



Tea, *Thea (Camellia) sinensis*

By DOUGLAS G. THOMPSON

Mr. Thompson is the President of the Pacific Camellia Society. The following excerpts are taken from a transcription of the tape-recording of his talk on this subject at the fifteenth annual American Horticultural Congress held at Pasadena, California, in November, 1960.

IN A CURIOUS POETIC ALLEGORY, Robert le Grand many years ago wrote of the lost fragrance of the camellia. He told how Venus had ordered Cupid to be whipped with the stems of roses, and how Flora, goddess of flowers, who was moved by pity for Cupid dispatched Zephyr, the west wind, to Japan to bring back the stems of the thornless rose, known to the gods as Anacanthus and later to men as Sasanqua. The whipping of Cupid was then carried out in painless formality. Venus thereafter hated the thornless rose, deprived it of its fragrance, and banished it behind the impenetrable monsoon curtain of southern China. There it languished for untold years in a sun-warmed, semitropical forest, fed by the soft damp carpet of forest mold and watered by the rain mists, until found by man who prized it for the brew from its leaves.

Some have claimed that Confucius taught the drinking of cha or tea to insure the boiling of foul water. Others have pointed to the Emperor Shen Tung who was divinely led to the beverage in 2737 B.C. Then there is the provocative legend of the "Eyelids of Dharma." Whatever the origin may be, we know that by the seventh century drinking tea had become an important custom in China, and that by the eighth century Japan had borrowed and refined the art of brewing and serving tea into an esthetic, indeed a religious rite. For centuries, too, China and Japan harvested the seeds for domestic oil, a practice that still continues.

At the time the voyages of Columbus were opening up new worlds Feng Shi-Ko, living in Yunnan Province, China, listed in his botanical records some seventy-two varieties of camellias of the Ming Dynasty. He quoted from a thousand-year-old record of flowers and trees in the Imperial Park, in which he found names of "blooms exquisite in their imagery: Precious Pearl, Palace Exhibit, Rouge Colored, Strung Pearl, Illumine the Hall, and Thousand-Petalled White." The only one of all he described that might possibly be identified is Thousand Petalled-White. This may be *Camellia japonica alba plena.*

The history of the camellia in the western world began with tea a thousand years later. There is record of a letter, written in 1615 from one member of the East India Company in Macao to another member in Japan, in which he mentioned "a pot of the best sort of chaw." This is believed to be the first record of anyone mentioning tea in English. In 1659, the London journal *Mercurius Politicus* proclaimed in an advertisement that "excellent, and by all physicians approved, China drink called by the Chinese cha and by all other nations tay, is sold at Sultan's Head Coffee House." And in 1660, Thomas Garway, a proprietor of a London coffee house, offered this new drink as "good against crudities, strengthening the weakness of ventricle or stomach, causing good appetites and digestion, and particularly for men of corpulent body and such as are great eaters of flesh."

Also in 1660, there is a curious entry under the date of September 25 in Samuel Pepys' Diary: "And afterwards I did send for a cup of tea (a China drink) of which I never had drunk before." It is disappointing that Pepys fails to note his reaction.

Tea came to England with such impact that by the early 1700's close to twenty thousand pounds were being imported annually. It was purchased initially from the Plantations near the port of Amoy in the China Sea and later from Madras and Surat. Tea sold from four to fifteen dollars a pound, an expensive article by the standards of that day and within reach only of the affluent. It was a precious cargo for the clipper ships that were in competition in the China trade, and with the tea came the ornamental camellia plant, introduced in the hope that domestic tea culture might be possible. Sea captains, not botanists, are said to have unwittingly brought back the ornamental camellia, because the wily monopoly-conscious Chinese substituted it for the coveted tea plant *Thea (Camellia) sinensis.*

The flowering camellias resemble the tea plant; it is no wonder that European travelers to China in the seventeenth century were confused. They were restricted to the coastal areas, far from the tea-growing districts, and had to take the word of those who passed the plants to them.

Father Le Compte, who in visiting China had seen and classified both the species *japonica* and *sinensis,* ruefully commented that if the Chinese were not such great cheaters, their tea would be better. They frequently mixed herbs with the tea. John Barrow, another traveler to the Orient, mentioned the substitution of unrooted branches for authenticated rooted plants. The branches were merely pushed into the pots that had been placed aboard ship. There are doleful tales of potted plants smashed on deck by cannon fire, of seeds dried out and mildewed or completely corrupted by salt water, of tempests encountered in sailing around the Cape of Good Hope. In spite of trickery and tempests, some plants and seeds survived and reached Britain, but tea as such was not successfully grown there.

The first *Camellia japonica* is reported to have reached Europe in the last quarter of the seventeenth century—a tiny plant in an urn made of mother-of-pearl, a gift from a Moravian Jesuit to Maria Theresa, wife of the reigning King of Spain. The priest was Georges Josephe Kamel,

missionary to Manila. Since the Philippine climate is not suited to *C. japonica,* the plant that Maria Theresa received was probably not *C. japonica* but another species.

John Cunningham, an English physician, stationed at Amoy in the latter part of the seventeenth century, is credited with having had much to do with the introduction of camellias to Britain.

When the Swedish botanist and physician Carl Linnaeus (Dr. Carl von Linné) published his *Genera Plantarum* in 1737, he conferred the name *Camellia,* in honor of Father Kamel, on the plant in place of the Japanese name Tsubake. He thus honored Kamel for his contributions to Far Eastern natural history.

It is interesting to note that within the last few years records have been found which show that the camellia had made an earlier appearance in the western world than was previously known. The United States Department of Agriculture explored the ornamentals of Portugal in cooperation with Longwood Foundation, Inc., and in 1959 published the findings. This focused attention upon some very old, long-forgotten camellia trees, now considered to be the earliest specimens of *C. japonica* to have been planted in the western world. These are in the garden of Villa Nova de Gaya in Oporto, Portugal. The family archives of the Conde de Campo Bello, owner of the Villa, say that living plants of *C. japonica* were brought back from Japan and set out in the garden in the middle of the sixteenth century. And there they still stand after four hundred years.

Portuguese traders first made contact with Japan about 1542, and after 1550 exotic plants found their way across the sea. Portuguese were master mariners in their day, and captains, diplomatic envoys, and travelers participated in plant explorations during the Renaissance.

There is record of *Camellia sasanqua* in France in 1785, and in 1792 a captain of the East India Company brought back *C. japonica alba plena* and a few other varieties. By 1831 there were twenty-eight varieties of camellias in England, a remarkable achievement considering the hazards of transportation. Each plant rested in its own little earthen pot or woven basket with a handful of Chinese soil. Each little plant had to be nurtured month after month, in good weather or bad, through growth and bloom cycle, in order that it would reach its destination alive. This was no mean accomplishment.

In 1801 camellias were being propagated and sold in Belgium. In 1809 the first public exhibit of camellias took place at the Ghent Flower Show, and thereafter camellias became a regular feature of the show. Amateurs were encouraged to become collectors and nurseries sprung up whose names are familiar to all interested in horticulture—Verschaffelt, Donckelaar, De Longhe. The year 1825 was the "golden age of the camellia"—Verschaffelt listed one thousand varieties.

It was in France in the 1840's, however, that the popularity of the camellia reached its height. At that time no Parisian would have considered himself properly attired without a camellia boutonniere, and every one wept over Alexandre Dumas the younger's tragic tale *La Dame aux Camélias.*

During the mid-nineteenth century nurserymen in Italy, France, Belgium, and Portugal developed hundreds of new varieties. Ghent became the "camellia capitol of the world." Then enthusiasm suddenly waned, styles changed, and interest in the culture of camellias and in obtaining new varieties declined. By 1860 camellias were being replaced by long-stemmed roses, carnations, and strelitzias, and gardenias were proper for boutonnieres. By the beginning of the twentieth century the camellia had quietly disappeared, with carpet bedding, wired bouquets, and staid refinements of the Victorian period.

While Europeans were sipping tea and admiring exotic blooms, our American forefathers were becoming similarly intrigued. As in England, interest in America centered largely on how to derive more coins for the purse rather than on how to create fanciful new flowers. The story of the camellia in the New World begins in Georgia with attempts to cultivate the tea plant. Francis Moore narrates his trip to Savannah in 1738, when he visited the famous garden that had been laid out by General George Oglethorpe in 1733. He tells of the fruits and other plants—of apples, olives, figs, pomegranates, coffee, coconut, cotton—and comments on how bamboo, imported from faraway eastern India, flourished in the garden. He tells of tea seeds, shipped from East Indies Islands, but they, Moore relates sadly, did not grow although great care was given them. There is an interesting pronouncement in the United States Patent Office records of 1854 that the tea plants were imported to Georgia in 1772. It concludes that "hampered either by accident or from want of cultural knowledge, efforts to establish tea were unsuccessful." It seems certain that a planting on a limited scale was established on Skiddaway Island in Georgia. Anyway, the tea ventures of the South seem to have suffered because of insufficient capital, poor cultural practices on the plantations, and the mediocre quality of the tea itself. It was denounced by connoisseurs as weak—they contended that a strong brew required a robust climate, more temperate winters. American tea failed.

Individual specimens of *Camellia sinensis* continued to be grown under greenhouse culture, mainly as curiosities until the War between the States.

There is a record that the first shipment of *Camellia japonica* from Europe to this country was to John Stevens of Hoboken, New Jersey, in 1797.

The 1880 report of the Massachusetts Horticultural Society tells how Michael Floy came from England to New York and brought with him a plant of *Camellia japonica alba.* Mr. Floy established a nursery at Twelfth Street and Broadway in New York, and he planted the first seed of *C. japonica* in America in 1890. He introduced many fine varieties, a number of which are still grown today. Many other fine nurseries turned their attention to camellias. In Boston, Marshall P. Wilder and C. M. Hovey operated nurseries which became recognized throughout the world. Dr. J. S. Gunnell established his greenhouse across the street from the capitol in Washington, D. C. Two hundred and thirteen varieties were catalogued and distributed during the first quarter of the nineteenth century. At least seventeen of them are to be found in present-day collections. Interest in camellias passed its peak in this country when the clouds of the Civil War began to gather. Greenhouse culture of camellias died abruptly, and it was never revived to any great extent.

Left. *Camellia japonica.* Upper right. *Camellia sasanqua,* Palmer's Double Sasanqua. Lower right, *Camellia reticulata.*

At the turn of the nineteenth century André Michaux brought three plants of *Camellia japonica* to Middleton Place, South Carolina, and from this modest beginning arose the famed Middleton Gardens. He began what might well be considered the oldest outdoor planting of camellias in America. By 1840 Rev. John G. Drayton had imported plants from Belgium and France to Magnolia-on-Ashley, South Carolina, and created the Magnolia Gardens. In 1947 Magnolia Gardens offered one hundred and fifty of their own varieties which they had developed from seedlings. Many of these are the finest available today. Throughout the South, plantations featured camellias. In a sense, with magnolias and azaleas, camellias symbolized the way of life in the South—the pace and pattern of southern gentry.

Visited by war's ravages, and the palatial dwellings destroyed, the plantations and their gardens reverted to wilderness. During the difficult years of reconstruction, the camellia went out of fashion.

It was not until 1900 that Edward Avery McIlhenny began to scour the countryside of the South for any surviving camellia specimens. His interest spurred others. He brought the treasures he found to the Jungle Gardens on Avery Island, Louisiana. Under his enthusiastic leadership, the camellia was restored to favor and again graced southern gardens.

California came into the camellia story as early as the Gold Rush. In 1848, lured irresistibly by gold at Coloma, fifty miles south of Sutter's Fort, prairie schooners began to move across the Great Plains. The camellia pursued its relentless circumnavigation around the globe from China to Europe and eastern America and thence to California.

Among the stern pioneers there was James L. L. F. Warren of Boston, a plant lover and a man of foresight, who introduced the camellia to California. He followed the Gold Rush not to the mines but into the trucking business in Sacramento in 1851, and in connection with trucking he established Warren and Co., New England Seed Store. In January, 1852, he advertised the expected arrival of his first shipment of plants and seeds. This was followed by a notice in the *Social Union* of "receipt via Panama on February 7, 1853, of 3,000 lbs. of garden seeds, warranted fresh of every kind of new variety. A splendid set of dahlia roots, roses, camellias, grapevines, bulbs, etc., will be ready for examination in our hall above the store on Monday." The camellias arrived by Pacific Mail Company Steamship "Panama," "carrying four hundred and eighty-four passengers and forty females." *Camellia japonica alba plena, C. fimbriata,* and varieties 'Mrs. Albee Wilder' and 'Lady Hume's Blush' were in the groups of plants that went on display.

Warren's faith in camellias in Sacramento was not in vain. The first California State Fair in San Francisco in 1854 displayed many varieties. The Golden State Nursery in San Francisco advertised some seventy varieties, and a sizeable outdoor planting was made in Smith's Palmological Garden and Nursery in Sacramento. In the 1880's interest languished. However after two generations of neglect, interest was renewed, and in 1941 the camellia was declared the official flower of Sacramento. Today there are about fifty thousand plants in the city—more than five hundred varieties in Capitol Park—and in that park a special grove is dedicated to "Gold Rush Pioneers."

To the long-range vision of Henry P. Huntington—and his desire to possess a collection of rare plants—we owe the existence of the Huntington Botanical Gardens. In 1903 Mr. Huntington purchased the San Marino Ranch that had

(Continued on page 122)

SHRUBS WITH FRAGRANT FOLIAGE

By HELEN M. FOX

Mrs. Fox is author of several books and has contributed articles on gardening to a number of publications. She is especially interested in lilies, herbs, and shrubs. Mrs. Fox is a member of the Advisory Council of The New York Botanical Garden.

BOTANISTS and others who write about plants and gardens seldom aptly describe fragrance. Perhaps the reason for this is that a vocabulary for smells is practically non-existent. Such words as spicy, minty, flowery, or camphoraceous have to be used; the scent of roses is described as either pure rose or like that of a fruit or spice. Many writers use aromatic, which means the same as fragrant and is not definitive. Botanists cannot be expected to be poets, but some, notably Liberty Hyde Bailey, have a remarkable choice of words for describing plants, and Linnaeus is a never-ending source of wonder in his selection of descriptive words for binomials.

The result of odor in plants, whether pleasant or not, is the attraction of insects which effect fertilization, except perhaps in pitcher plants. The odor of the latter, like that of decaying meat, serves to trap insects which may be used as food. Relatively few plants have fragrant leaves with the exception of the large family of *Labiatae,* some of the *Verbenaceae,* a few roses, magnolias, and so on. Fragrance is usually concentrated in the flowers, with the result that insects will go straight to stamens and pistils and assist in pollination. Plants with a strong scent do not, as a rule, have conspicuously colored flowers.

The longer one gardens with herbs, the more attractive and important fragrance becomes, and discrimination develops in detecting intensity of and difference in odors present in flowers, foliage, or roots.

HARDY NATIVE PLANTS

Where I live, in southern New York State, two native wildlings, both members of the *Myricaceae,* are found straggling along dry sunny banks. One is *Myrica pensylvanica* (formerly *M. caroliniensis*), having the common names of bayberry, candleberry, candlewood, candle tree, tallow herb, sweet-oak, and tallowberry, all descriptive of its uses or fragrance. Bayberry is a "herb" because of its medicinal virtues. According to *The United States Dispensatory,* it was once used extensively in medicine, for the bark is mildly stimulant and astringent, and in large doses emetic. *M. pensylvanica* is found from Nova Scotia to Florida and Louisiana, on the borders of the Great Lakes, and in Indiana. It is deciduous and spreads over a considerable area through its roots. In my neighborhood this shrub grows from four to six feet high, but sometimes reaches nine feet. The branches, cinnamon-colored when young and dark brown when old, have glands on them. The leaves are somewhat stiff to the touch, glossy above, and have many tiny glands on their under surface. They are rounded at the tip and wider above the center, and about three inches long. In autumn, the green is darkened with maroon. They smell deliciously of lemon, bay, and orange peel as does *Myrica asplenifolia.* The flowers are unisexual, the male in catkins and the female in rounded clusters; the latter develop into small round fruits with a gray covering which furnishes the wax for candles. This wax is also taken from the fruits of *Myrica cerifera.*

At one time a woman who worked for me would take a handful of the fruits, wrap them in cheesecloth, and rub the bottom of an iron with them. This imparted a pleasant fragrance to sheets and pillow-cases as she ironed them.

Another member of the *Myricaceae* is *Myrica asplenifolia,* sweet fern (according to Dr. Gleason in *The New Britton and Brown Illustrated Flora of the Northeastern United States and Adjacent Canada),* formerly called *Comptonia asplenifolia,* or *C. peregrina.* This low fragrant shrub thrives in sweet soil and in sun and is to be found in eastern North America and westward to Michigan. The plant, about three feet tall, has numerous brown branches which come into leaf early in May. The male flowers, as in bayberry, are pendulous brown catkins which are suspended over the rounded female flowers. The catkins are about one inch long, while the female flowers are small and round. The slender leaves grow out of old wood, are two inches long and half an inch across, furry above and below, and deeply and pinnately cleft. Both types of flowers as also the leaves turn maroon in the fall. The whole plant is fragrant, the leaves more strongly so. They smell, as does bayberry, of lemon, bay, and orange peel—at least according to my diagnosis. There is a great difference in the reporting of smells; some of this may be due to the weather, the season, and the individual.

Sometimes I pick a few of the leaves of *Myrica asplenifolia* and put them in a small pitcher or cup filled with hot water; the result is a delicious stimulating drink. *The Dispensatory of the United States of America* says the oil distilled from the plant contains considerable tannin as well as other constituents and was formerly used medicinally. On the northern tip of Long Island this plant grows in profusion, and it is said that Indian squaws used to pick it to sell to the settlers' wives.

From Maine to Texas the spice-bush, *Lindera benzoin* of the *Lauraceae,* is a common underbrush in woods. In April and early May when the clusters of little greenish yellow flowers appear on leafless branches, they create a mist-like effect through the trunks of tall trees. The flowers are followed by bright red fruits. The oblong-obovate leaves turn light yellow in autumn. The whole bush has a spicy, pungent aroma and tastes as true benzoin smells. (The true benzoin comes from *Styrax benzoin,* a tree native to Sumatra and Siam.)

Peter Kalm, a pupil of Linneaus, who traveled in eastern North America in the late eighteenth century, spoke of how refreshing it was to drink a beverage made from young twigs of the spice-bush, a drink he had learned about from the Indians. In his diary he says the drink was given as a stimulant and to cause perspiration and also as an emetic.

According to Rehder there are sixty species of *Juniperus.*

Bayberry *(Myrica pensylvanica)*

The low ones are admirable for borders and especially for rock gardens where they furnish a green background to early spring bloom, as well as attractive growth and fragrance all winter long. *Juniperus pfitzeri* and *J. horizontalis plumosa* are to be recommended because their leaves turn purple in winter. Variety 'Bar Harbor', which turns reddish and has a strong smell of camphor and turpentine, is also to be recommended. Many nurseries carry a considerable collection of these junipers, and it is a good idea to select them in winter when one can observe their coloration.

Junipers belong to "herbs" because of their fruits which are used in gin and also as remedy for kidney troubles.

Exotic Hardy Plants

The smell of box always reminds me of Old World gardens and particularly of gardens along the James River in Virginia where specimens have grown fat and humpy, and where their special scent composed of resin and almond pervades the air. The oval, glossy, evergreen leaves on *Buxus sempervirens,* the evergreen tree box, grow thickly on the branches, are notched at the apex, and are from one to one and a half inches long and paler green on the under surface. This box has many variants in form and color of foliage; among these are one with leaves variegated with yellow and another with leaves of a dark blue-green. *B. sempervirens* will grow to thirty feet high but is generally kept lower by shearing in order to train it as a hedge or as accent specimens. Because of this shearing, the flowers, pale green with yellow, seldom mature. This is a pity, for they are handsome and have a pervasive fragrance. The evergreen box is hardy in southern New York, but most gardeners cover it with unsightly burlap in winter. To keep off the sun and to prevent too early a comeback of growth in the spring, a light covering of salt hay can be spread over the plants and this covering held in place by branches of hemlock or other evergreens.

Buxus sempervirens is native to Europe, North Africa, and western Asia, and because of the elegance of its branches was widely used in decorations in olden days. According to the *Dispensatory,* its leaves cause dermatitis in some people and are poisonous if eaten. They were used medicinally in bygone days but are no longer considered to be therapeutic.

A dwarf box, called *Buxus microphylla* var. *koreana* by Bailey and Rehder, came from Korea in 1919. I was given one of the first plants by Leonard Barron and have had its descendants by way of cuttings ever since. It has a slight yellow tinge which is particularly noticeable in spring. In my garden the branches spread sideways, so I shear them back in spring to encourage them to form a close hedge. This box is the perfect edging for a garden in cold climates, being hardier than *B. sempervirens.* It is too low for a hedge, not being taller than two feet.

A few shrubs which rightly belong in the herb garden are so attractive, because of their fragrant foliage, good looks, and bloom from midsummer to early fall, that they grace any planting. These are *Vitex, Elsholtzia, Perovskia,* and *Caryopteris,* all exotics and all "die-backs." The problem with "die-backs" is their unsightliness in early spring, when they generally present a cluster of untidy stems of different lengths pointing hither and yon. The best way to handle them is to plant the taller ones behind low ever-

Benzoin *(Lindera benzoin)*

green shrubs and the lower ones among daffodils or lilies. If they are planted with lilies, they will probably bloom at the same time as *Lilium speciosum, L. henryi,* and *L. formosanum.*

A shrub of the *Verbenaceae* I have grown for many years is *Vitex negundo* from north China. It is a graceful, much-branched shrub which will grow ten feet high. The branches are four-angled. The opposite leaves feel soft to the touch but are firm enough to stand out. The flowers are borne in mid-August in branched spikes; each branch is five inches long. The corollas are two-lipped and funnel-form, violet and white. The whole plant has a pleasant strong resinous aroma. I raised mine from seed and grow it on a sunny slope behind broom.

A variety called *incisa* has deeply serrate and practically pinnatified leaves. The whole plant, as also the leaves, is smaller than the type.

Vitex agnus-castus or chaste-tree, also called monks pepper-tree and hemp-tree, comes from southern Europe and western Asia and has been in cultivation since 1570. (There are about sixty species of *Vitex* in tropical and sub-tropical regions.) This shrub will grow to nine feet high. The violet flowers are produced in whorls along a single spire, about four and a half inches long. There is a white-flowered form called *alba.* The flowers on both last a long time; they appear in mid-July and continue well into August. The leaves are five-divided, pointed, grey-hairy underneath, and have entire margins. The leaves smell pungent, rather like pine, and the flowers a little of heliotrope.

The branches make excellent cut flowers and are good companions to gladiolus. In ancient days the trunk was used to make statues of gods. However, *Vitex* is not listed in the *Dispensatory.*

Late in August an inconspicuous shrub mingles its somewhat prostrate stems among other plants in the garden. This is *Perovskia abrotanoides* of the *Labiatae.* The shrub

Perovskia atriplicifolia

Vitex negundo

comes from an area extending from Afghanistan to Thibet and was introduced to cultivation in 1904. I have grown it and *P. atriplicifolia;* the latter appears more upright and taller, reaching five feet in height. They both require sunny, well-drained situations. *P. abrotanoides* comes out of the ground long after other plants and is often shaded by the earlier ones. It is called Russian sage, but to me does not smell nor look like sage. It smells like rosemary, only not so sweet, and looks like some of the lavenders, such as *Lavandula canariensis.* The stems are square and slender; the young stems are silvery, almost white. The flowers are borne apart, not close to one another, in branched panicles. They are two-lipped, violet-blue, and three-eighths of an inch across. The gray-green leaves are twice-divided, almost pinnately, and are one and a half inches long and the same across. Both of these plants are handsome and particularly charming when grown among the blue-green foliage and mustard-yellow flowers of rue *(Ruta graveolens.)*

Caryopteris incana from north China is commonly called bluebeard. This member of the *Verbenaceae* is a late September-flowering shrub; it grows about two feet or more high. I once had it in a sheltered place on a slope where it persisted for several winters. I also had a white- and a pink-flowered form, but there is no mention of these today in any of my numerous plant dictionaries, nor can

Bluebeard (*Caryopteris incana*)

I find them in catalogues. The stems are green, tinged magenta, entirely magenta at their summits, and they are covered with short hairs. The leaves have large, rounded teeth, and their upper surfaces are velvety. The flowers are in opposite whorls. Each blossom measures three-quarters of an inch across; the calyx is green tinted violet, the slate-blue corolla is deeply lobed, and the stamens are exserted. In *C. mongholica* the leaves are lanceolate, and have either few teeth or none at all. The fragrance of both is pleasantly resinous with a slight trace of rosemary.

Caryopteris clandonensis 'Simonds' is entirely hardy where I live. I raised it from seed which came to me from the Royal Horticultural Society. It is about two feet high, and blooms in early September on this year's wood, so that it has to be pruned back hard. The leaves, narrow and ovate, have a few teeth along the margins. The blue flowers appear feathery. The whole plant has a suede-like finish and is fragrant. My plants have been increased by cuttings and now, planted between peonies, form a fringe to my shrubbery border.

A shrub which was introduced from north China in 1909 is *Elsholtzia stauntonii* of the *Labiatae*. It thrives in sun and seems to go limp in shade. It is a die-back, and its bare untidy twigs present a sad sight in spring. In my garden it grows about three feet high, but is reported to reach five feet. Perhaps it would be taller in a milder climate, but I cut back the stems quite far down in fall. *E. stauntonii* can be readily increased by division; the stems are not too woody. They are stiff, green, hairy, and smooth to the touch. The leaves are long and slim, wider below the center with large teeth, hairy yet smooth to the touch. They are thin-textured, one and a half inches across and five inches long. When rubbed they smell of mint, though not so sweet as true mint. The flower-crowded whorls form one-sided, spire-like inflorescences at the tips of branches. Some measure five and a half inches long; but others are smaller. The flowers are a velvety plum color, lighter than the form called *farquhari* that I bought some years ago. *E. stauntonii* is not in the *Dispensatory*.

The rose best known for its fragrant leaves is *Rosa eglanteria*, the sweetbrier or eglantine. It has densely interlaced branches, five to seven feet high. The oval leaves (five to seven) are glabrous and hairy beneath. They smell like green apples when wet. The bright pink flowers measure one and a half to two inches across, and may be solitary or up to three together. The sepals are pinnate and semipersistent. The fruit is ovoid, orange-scarlet, and to one inch long. *R. eglanteria* is of European origin; *R. rubiginosa* is given as a synonym. Var. *duplex* has double flowers. The single form is one parent of the famous and beautiful Penzance Hybrids.

Exotic and Not Hardy

Where I live in Westchester County, New York, the tall lavenders such as *Lavandula officinalis* and *L. stoechas* are not hardy, but plants of *L. officinalis* var. *compacta*, a dwarf form, have proved to be hardy except in severe winters. The dwarf plants are twelve inches or so high and become quite broad; in fact, after three years in the garden they can easily be divided. They are shrubs because of their woody stems, but they are usually classed as herbs—and they are herbs because their fragrant foliage is used in cosmetics and medicine. The whole plant is redolent of lavender; however, the greatest concentration is in the flower buds. Dwarf lavender has flowers in several shades of violet and pink, which I have found to be the most fragrant. Lavender blooms from late June through July, and during this time it dominates the garden with its

Elsholtzia stauntonii

beauty. Its foliage remains violet-tinged all winter. I always make cuttings to carry over in a protected coldframe in order to have replacements to meet such disasters as may occur in a snowless temperamental winter, for I never know when the plants will come through unharmed.

In favorable circumstances, *Rosmarinus officinalis* will develop an almost tree-like trunk, to six feet high, with somewhat shredded bark. This shrub originated along the Mediterranean and is temperamental as to hardiness. I grew it in my former garden along the Hudson River, and there it came through unharmed. The leaves are long and narrow with incurved margins and arch to show the grey undersurfaces. There are specimens with needle-like leaves, and some have a somewhat pyramidal shape. The typical color of the flowers is a light blue, but there are forms which have white and also pink flowers. *R. officinalis* blooms in late winter and on into May. The whole plant is very fragrant; it has a characteristic warm odor, sometimes described as balsamic. Var. *prostratus,* a low recumbent form whose branches are level with the ground, is the least hardy. Rosemary is a famous "herb," whose leaves are used for perfumes and medicines and as flavor in food.

A friend of mine, Violet Walker, who lived in Woodbury Forest, Virginia, had huge tall bushes of lemon-verbena, *Lippia citriodora,* in enormous pots. These bushes had been grown by the previous generation. They were wintered in an enclosed but unheated place and wheeled into the garden every spring. My plants, too, are brought in for the winter. They are small, however, and do not grow over two feet high. *L. citriodora* truly smells of lemon, and the leaves are delicious when steeped in teas or added to syrups in cooking fruit and making jellies, along with the fragrant-leaved pelargoniums. (The latter are not included in this article, because they behave more like perennials in this climate, although in California, Mexico, and similar climates they develop tall bush-like growth.) The leaves of lemon-verbena are slender, grow in whorls of threes, and are crisp in texture. They have a prominent central vein depressed on the upper surface. The flowers are tiny, very pale lavender, and grow in terminal panicles. They are not medicinal. The plant came from Argentina and Chile and was named for Dr. August Lippi, a French traveler. It has been in cultivation since 1784.

Myrtus communis of the *Myrtaceae* comes from southern and eastern Europe and on into Persia and Afghanistan, where it grows ten feet high. The young wood is brown and downy. The plant has thick, glossy foliage; each leaf is pointed and about one inch long. The leaves give forth a scent of rosemary combined with flowery elements but are bitter and taste of laurel. Snow-white flowers, their centers filled with frothy white stamens, appear in summer; they are nearly always solitary and on short stalks. The flowers are followed by purple-black fruits, one-half of an inch across. *Myrtus communis* furnishes a beautiful hedge and is planted for this purpose in California. It thrives in hot situations. For me, alas! it is not hardy and has to be wintered in a greenhouse. The plants yield an oil, called "myrtol," which is antiseptic and stimulant and has been used in bronchial and pulmonary disorders.

Laurus nobilis, the sweet bay or bay tree, of Mediterranean origin and belonging to the *Lauraceae,* is the laurel of legend, history, and poetry. The leaves smell of bay and have a distinctive, somewhat pungent cinnamon flavor. They are from two to five inches long, short-stalked, and terminate in points at both ends. The margins are slightly undulating and are crisp and hard to the touch. When raw they taste bitter, but cooked in soups and stews they impart a spicy unusual flavor. The greenish white flowers, half an inch long, are followed by egg-shaped fruits which ripen black and are thought to be emmanagogue. The oil they yield is used in perfumery. The bay tree grows slowly and is not reliably hardy north of Zone 6. Where it has to be wintered indoors, it does well in a wooden tub. It likes a peaty soil and plenty of moisture. *L. nobilis* is readily increased by cuttings.

Readers of *The Garden Journal* may be familiar with the beautiful blue-green, highly scented leaves of *Eucalyptus,* as these are to be found in florists' shops and are used in flower arrangements. They probably are not so familiar, however, with the red, white, or yellow flowers whose beauty rests in their numerous showy stamens. There are three hundred species of *Eucalyptus,* practically all native to Australia; they belong to the gum tree family or *Myrtaceae.* Eucalyptus are included here because, though most of them are tall trees, a few low species would come under the heading of shrubs. Among these are *E. cornuta, E. macrocarpa,* and *E. preissiana.* Eucalyptus are grown in many warm countries, notably Israel, along the French Riviera, and in California, where they are admired for their unusual appearance. They furnish wood for fires and pasture for bees. Because the long narrow leaves curl up and drop on the ground, eucalyptus are, however, somewhat untidy.

DWARF ROSEMARY AN ELIGIBLE HERB FOR BONSAI

By ELEANOR P. CHALFIN

Mrs. Bruce Chalfin of Plantation Gardens, Rustburg, Virginia, is well known for her fine collection of herbs.

HAVING ALWAYS DOTED on tiny and ancient Oriental things, I became bitten by the bonsai bug when I chanced upon an article about the fad for bonsai in this country. As I am a dedicated gardener with faithful allegiance to herbs, a list of possible plants quickly suggested themselves. Dwarf rosemary *(Rosmarinus officinalis prostratus)* led all the rest and subsequently did not let me down in any way.

My first step was to study an authoritative book on the art of creating, training, and caring for bonsai plants. The advice in *Miniature Trees and Landscapes* by Yugi Yoshimura and Giovanna Halford (a present from my son, then living in Japan) was simple to follow. I hoped for beginner's luck, since I was not choosing a cranky shrub, a troublesome tree, an ancient or unfamiliar plant, but a tried and true herb. Dwarf rosemary proved a perfect made-to-order plant for the role. The choosing of a three-year-old, one that would possess the proper patina to play the part and already be container-trained, set the stage. Then I asked myself, "Should it be cascade style, lopped off for a semi-

upright, left erect, or have a list to the side?" Semi-upright, slightly slanting seemed to me the right decision.

So with my feeling toward the plant subdued for the nonce, I snipped the first small twig. Before I dared to shear more, I slept on the problem. It was not until I felt sure enough that the judicious clipping began, in which I followed a preconceived pattern by cutting a few branches part way on the plant's left side. Since there are a front and a back to any bonsai, the shearing starts on the least developed side—even a well-rounded, natural specimen usually has one poorer facade. After another interval, when the rosemary showed no ill effects from its amputations, the final shaping was easy and the end in view accomplished: the herb was gracefully leaning in a very Japanese manner.

In spring the potted rosemary was set out on a sunny protected terrace, and the plant generously continued to bloom, with only the short flowerless space in midsummer that is its normal habit. The following fall root-crowding was evident. As I did not have an artistic container, I transplanted it into a larger-sized common clay pot, broader and more squat. Some side roots were first pruned, and the bottom soil was tenderly teased from the ball of earth with chopsticks—a pencil could have been used. My precious pigmy was then supplied with some new soil. During winter the plant was extended the hospitality of a cool, sunny greenhouse, where it gave weeks and weeks of floriferous performance.

A new thrill, the next spring, was to find that a rosemary of the *Forrestii* variety, which had been tucked in a coldframe for winter protection, had lost its symmetry toward the rear, had a waterfall of foliage in front, and was slim on both sides. Behold, a "do-it-itself" cascade bonsai— and with blossoms to boot, for the plant was budding bountifully and soon burst into full flower when transferred to the niche of a serpentine brick wall. There it could nestle comfortably, but remain sunned only on three sides to retain the self-produced guise.

Having two types of rosemary, differently styled, I am keen to try my hand at other herbs à la bonsai. Would *Lavandula stoechas* and *Artemisia canariensis* prove as elegant and eligible, as trimmable, trainable, and tractable? I doubt whether the littlest rosemary has any other herb contestant in these qualities, but I mean to experiment further.

I hope that readers of *The Garden Journal* are already acquainted with the two charming characters briefly mentioned here, since this short piece, like my plants, had to be pruned to size. But whether bonsai fashion or taken at face value, the little-leaved, small-statured rosemaries deserve a special spotlight. I am sorry that this condensed form cancels description of their evergreen costume and their jewel-like blue blossoms, and leaves small scope for cultural directions.

But a few quick pointers: outdoor life for the plant as much as possible; a sunny spot at all times; and a pot watcher ("plant-sitter") if you must be away from home so that the watering schedule is not skipped.

Plants may be purchased from a herb nursery or may be started from seeds bought from growers specializing in rare herbs. Seeds of dwarf rosemary germinate more quickly and more easily than do seeds of the common rosemary, *Rosmarinus officinalis.*

Dwarf rosemary trained as a bonsai plant.

THE MAGIC OF COLOR

By MARY FLEMING

Mrs. Fleming, who is Technical Assistant in the Cryptogamic Herbarium, is an enthusiastic gardener. She is active in the American Rock Garden Society and in the American Rhododendron Society.

THE EFFECTIVE USE of color combinations in flowering plants was impressively demonstrated by the massive plantings of the golden-yellow *Forsythia* and the lavender-pink *Rhododendron mucronulatum* that lined either side of the highway on the west side of the George Washington Bridge and came into view just after one left the toll booth. Undoubtedly this spectacular sight in early spring inspired

many to seek, as I did, the identity of the lavender-pink shrubs. A number of nursery catalogues were explored before I found a picture of the Korean rhododendron. (Other yellows that I have combined with *R. mucronulatum* are *Jasmine nudiflorum* and daffodils, and I am planning to use *Corylopsis,* a winter-hazel from Asia and a member of the witch-hazel family.)

Three years ago we moved to a new home, and my husband and I have developed a garden under huge trees. Instead of recovering and maintaining a formal lawn, we made plantings around the trees. Under an old saucer magnolia *(M. soulangeana)* we have massed hardy azaleas and rhododendrons. These are varieties in shades of lavender and purple: 'Conewago', 'Ramapo', 'Corsage', 'Sherwoodi', 'Purple Splendor', 'Herbert Gable', and others. The arching branches of the purple and white magnolia pick up the color of the rhododendrons, and the play of sunlight and shadow produces a striking pattern. Now the magnolia has rained its bloom and is turning green, and the white of azalea 'Indica Alba' or 'Ledifolia' *(R. mucronatum)* is showing. Soon the evergreen, salmon-pink azalea 'Louise Gable' will predominate, set off to advantage by the backdrop of Canadian hemlocks *(Tsuga canadensis).* On the opposite side of the driveway under another magnolia, the very early-flowering *R. mucronulatum* is cloaked in its green leaves. In company with it are other deciduous species of azaleas; the pinkshell azalea *(Rhododendron vaseyi)* is in bloom, and the pinxterbloom *(R. nudiflorum),* the swamp-honeysuckle *(R. viscosum),* and the sweet azalea *(R. arborescens)* will show their colors later. These are underplanted with club mosses *(Lycopodium lucidulum),* bleeding-heart *(Dicentra eximia),* Oconee-bells *(Shortia galacifolia),* and *Galax aphylla.*

Close by in the shadow of the majestic Atlas cedar *(Cedrus atlantica glauca),* the beautiful royal azalea *(R. schlippenbachii)* is in full bloom; the yellow *R. keiskei* has already spent its bloom. Next to a Swiss pine *(Pinus cembra)* are deciduous Ghent azaleas. The scarlet buds of Mollis hybrids are breaking, and before long their buttercup-yellow and orange tones will be in harmony with the blue forget-me-nots *(Myosotis scorpioides)* and ferns at their feet. The fragrant, pale yellow Ghent azalea 'Daviesi' is particularly delightful in this setting.

Under a linden tree *(Tilia vulgaris)* are the evergreen azaleas 'Sherwood Red', 'Sibelius', and 'Stewartiana' in brilliant reds, their intense colors softened by the serene white 'Delaware Valley', 'Rose Greeley', 'Palestrina', and 'Snow'. Reds which tend to be blotched by the sun are placed in dappled light; white flowers are put in darker spots where they are seen to advantage. Like a prima donna the beautiful dwarf *R. carolinianum* hybrid 'Windbeam' in full sunlight charms all who see its delicate pink flowers.

A look at one's garden brings the whole into focus, and careful attention not only to the immediate company of plants but their backdrop as well may suggest the replacement of a plant or plants for harmony of color.

Readers of **The Garden Journal** may be interested to learn of the series of articles on "Colour Schemes for the Small Garden" by David Wright, M. A., in the **Journal of the Royal Horticultural Society.** Part I, which appeared in the May, 1961, issue, discussed blue gardens, a scheme in palest yellow to include greenish yellows, primrose-yellow, and creamy yellow, and a scheme in greys, purples, and strong yellows. The Editor.

THE CAMELLIA (from page 115)

been owned and developed since 1848 by the pioneer rancher J. D. Barth Shorbe.

William Hertrick, now the distinguished Curator Emeritus of the Huntington Botanical Gardens, was engaged in 1905 to landscape this San Marino property. There were two twenty-year-old camellia plants on it. In 1909 Mr. Hertrick added camellia plants, purchased locally, to stock an Oriental garden; in 1918 he obtained plants direct from Japan. By 1944, the Huntington Botanical Gardens had seventy-five varieties. It was in that year that the Southern California Camellia Society began to take an interest in these gardens—they had become a public trust through the Huntington Estate. The Society has arranged for and coordinated the development of a camellia testing ground, and has set out to make it a place where the greatest number of camellias, properly labeled, may be grown.

During the first years of the twentieth century many camellias came from Japan. These bear recent names—names that do not belong to antiquity. Most camellias, however, in the 1920's, were sold by color—white, pink, red, variegated; in the mid-1930's, almost all were sold by name.

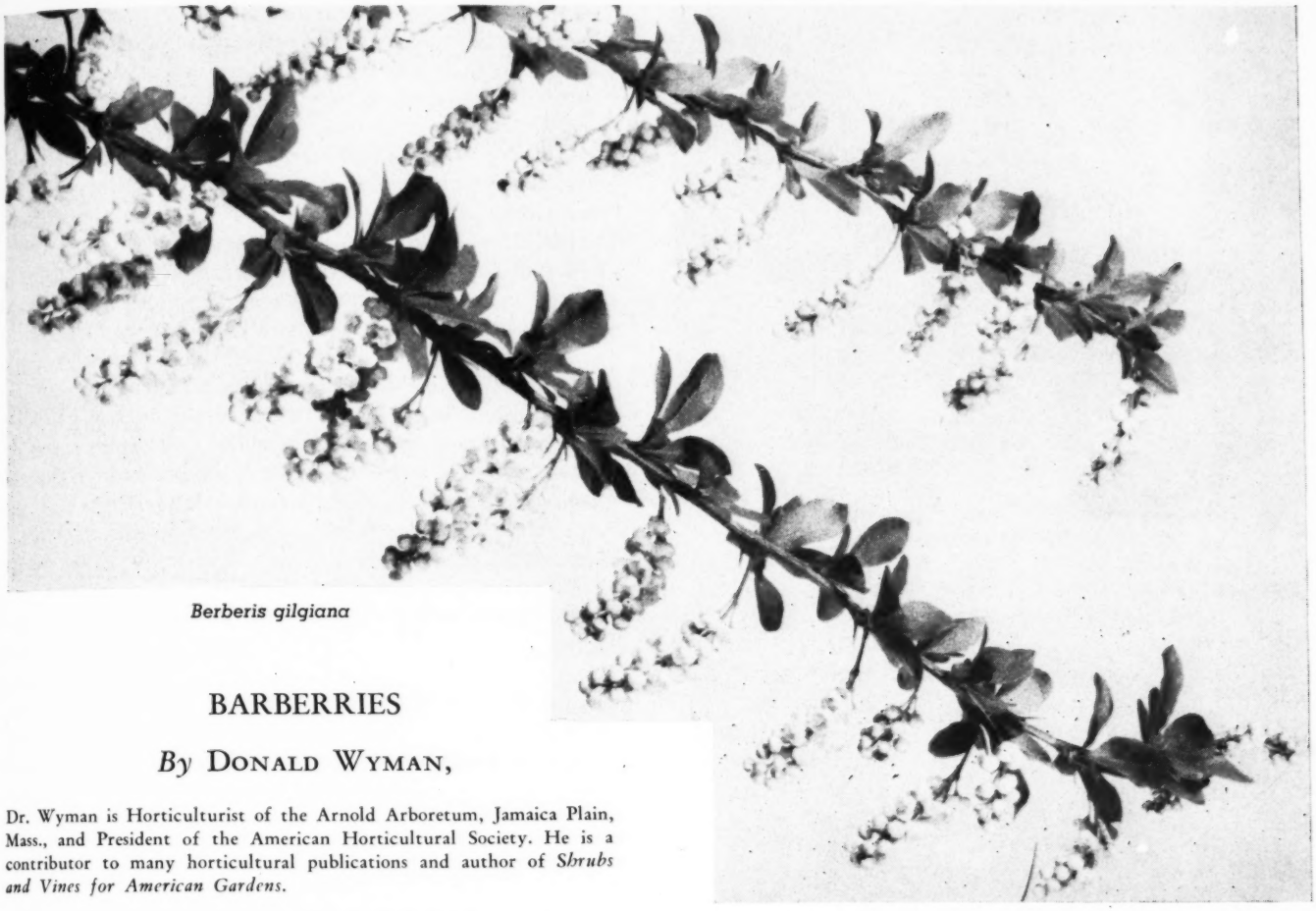
From the mid-1930's there has been a remarkable resurgence in camellias. Camellia societies were formed, camellia shows became annual events, collectors' enthusiasm reached an all-time high, nurseries found their sales of camellias increasing. In 1940 Manchester Boddy planted camellias—on thirty acres shaded by California live oaks—on what is now Descanso Gardens, the last remaining parcel of the land grant to Don José María Verdugo from the King of Spain in 1784. (Descanso Gardens are operated by the Los Angeles County Department of Arboreta and Botanic Gardens and the Descanso Gardens Guild.)

This camellia revival was accompanied by confusion in nomenclature. This exasperating problem is gradually being straightened out. In this respect, The American Camellia Society, organized in 1945, has been most helpful. Through its leadership and efforts more information on camellias—their history, their culture, their nomenclature—has been published than in any preceding period.

To southern California belongs another significant camellia contribution. In 1948 a shipment of twenty plants of *Camellia reticulata* arrived from Kunming, China. About the same time, the late Ralph Peer, former president of the American Camellia Society, independently procured a similar shipment. These two shipments were combined into a joint propagation project, and it now appears that there may be thirteen or fourteen distinct varieties of *C. reticulata.* [In 1924 *C. reticulata,* or Captain Rawes' camellia, was introduced to California by Eric Walther, Curator of Strybing Arboretum, Golden Gate Park, and a plant was given to the botanical garden of the University of California, Berkeley.]

There are exciting possibilities of other species and varieties with yellow and with purple flowers in northern Indo-China. These are tantalizingly out of reach, but if we can ever get behind the Bamboo Curtain, hybridizing with these unknowns could extend the color range.

Will the present revival last? We do not know. We can only be glad that the camellia has returned to popularity in our generation.



Berberis gilgiana

BARBERRIES

By DONALD WYMAN,

Dr. Wyman is Horticulturist of the Arnold Arboretum, Jamaica Plain, Mass., and President of the American Horticultural Society. He is a contributor to many horticultural publications and author of *Shrubs and Vines for American Gardens.*

AT THE TURN OF THE CENTURY, barberries were not frequently seen in gardens. They were rare plants. Fortunately, as a result of plant explorations throughout the world, many species and varieties are now being grown. In fact, the Japanese barberry that was a rarity in 1900 is now one of the commonest of all garden shrubs—it still remains at the top of the list as the most rugged and serviceable of plants. Also, it has run wild in the United States. Before I discuss some of the individuals in this group, let me first explain some points about the group as a whole.

Barberries are native in Europe, Asia, South America, and North America. The native North Americans do not compete well as ornamentals with those from other lands. The early settlers in America brought the common barberry, *Berberis vulgaris,* with them from Europe, because it was a vigorous, easily grown shrub, about nine feet tall, looking well in flower and fruit, and also possessing some economic value. The fruits were used in jellies. It thrived in America and soon became widely naturalized.

Then, in some of the wheat-growing areas it was noticed that the black stem rust of wheat, a serious disease, was always prevelant where the common barberry was growing. The best way to control the disease was thought to be to eliminate the barberry,* and in 1918 Federal legislation was passed to do just that. Some of the early colonies had passed legislation calling for barberry eradication as early as 1726. Today there are nineteen states where eradication programs are being carried out, namely, Colorado, Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Montana, Nebraska, North Dakota, Ohio, Pennsylvania, South Dakota, Virginia, Washington, West Virginia, Wisconsin, and Wyoming. Each year more than six hundred dealers' establishments and nurseries are inspected and issued certificates which permit interstate shipment of rust-free barberries.

Of some one hundred and seventy-five species and many more varieties of barberries, the United States Department of Agriculture lists sixty-four species and varieties that are sufficiently rust-resistant to be grown, shipped, bought, and sold in the wheat-growing areas. Not all of these are excellent ornamentals, but the list does include the most serviceable and beautiful of the genus. Only about two dozen of these are being offered commercially by the trade, but even these are enough to satisfy most gardeners.

Barberries vary in height from six inches to ten feet, but most of them are under five feet tall. They have the enviable reputation of being able to grow in poor dry soils. They have small yellow flowers (some of those grown in the South have beautiful red flowers) and either red, yellow-orange, blue, or black berries. Most of the barberries have short thorns which make them effective as hedge plants. Some are evergreen, and it is these that the home owner

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Control of stem rust is largely by use of resistant varieties of wheat and other cereals and by means of barberry eradication. The eradication of barberry is important in temperate zones, because it breaks the cycle of the parasite and thus prevents early spring spread of the rust to cereals. However, the rust develops on cereals in the South through the winter and moves northward into green spring cereal areas. Hence rust can occur even though barberry has been eradicated. Of greater importance justifying the destruction of barberry is the fact that new races of rust originate on barberry plants, and the new races may be able to infect resistant varieties of the cereals. C. R.

Berberis koreana

should scrutinize carefully for outstanding garden subjects.

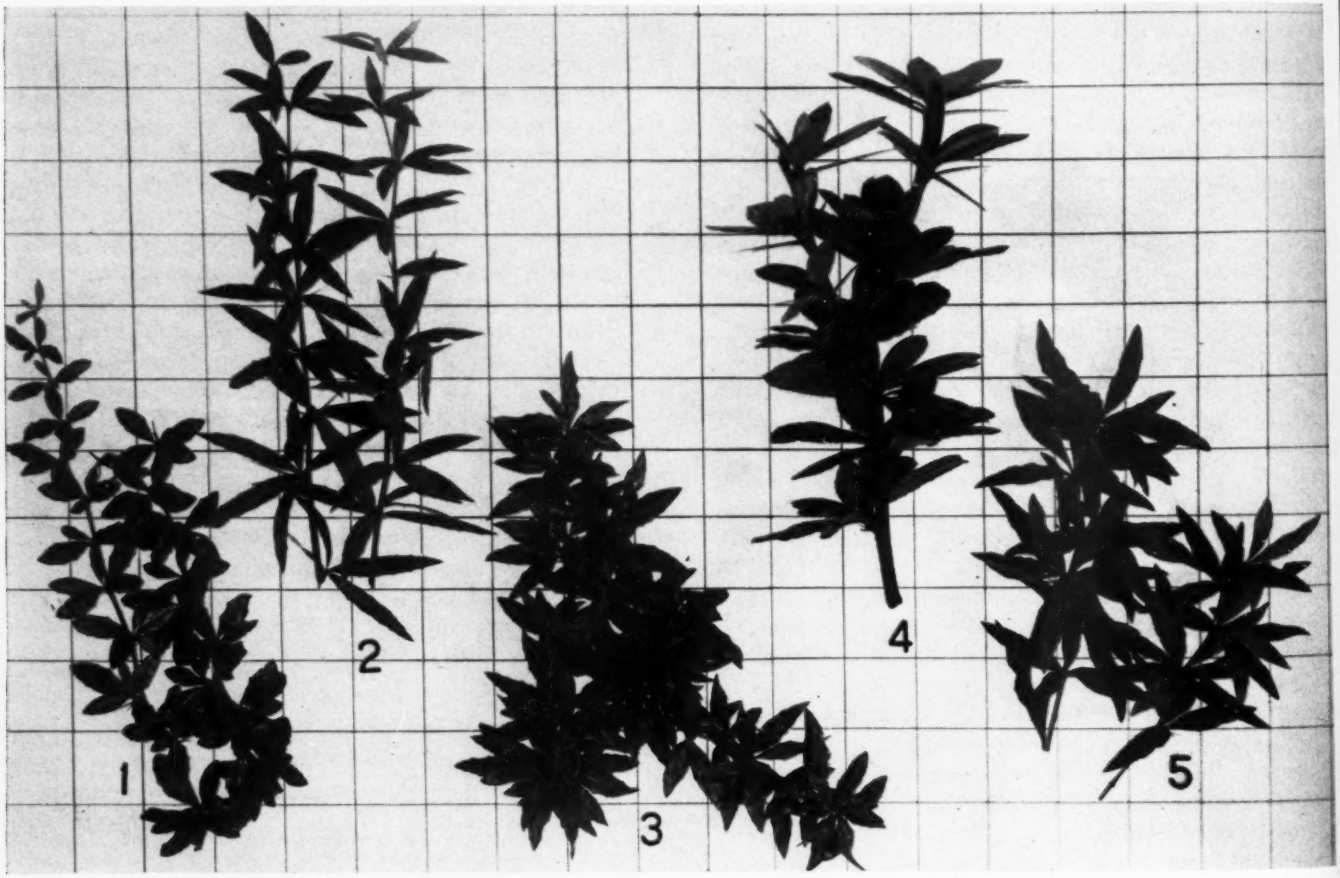
The only barberries worth growing today are those that the United States Department of Agriculture classifies as "rust-resistant." Consequently, all that are mentioned in the following paragraphs can be considered in this group, and most are available from some commercial source in America, although, admittedly, it will take a little searching to find some of them. Also, only those that are thoroughly hardy in the New York City area will be mentioned; however, it should be remembered that some of the beautiful ones seen in Scottish, Irish, and English gardens (like *B. lologensis, B. stenophylla* and its many forms, and *B. darwinii)* can be grown in the warmer gardens of the southern United States.

First for consideration should be the evergreen types. The warty barberry *(B. verruculosa),* one of the best, has spiny, dark green leaves which are white on the underside. It has a low (four feet high) compact habit, black fruits, and is a native of western China. Because of its habit it makes an excellent single specimen. It seems a pity to spoil their shape by growing plants of *B. verruculosa* closely together.

Berberis julianae grows to about six feet tall, has an upright habit, and definitely is more hardy than *B. sargentiana,* which need not be used. The spiny, evergreen leaves are sometimes three inches long. The black barberry *(B. gagnepainii),* another evergreen (from western China) is not especially outstanding, but is sometimes grown for its rather open habit.

What is proving to be the best of the evergreen types in the Arnold Arboretum is a hybrid named *B. chenaultii,* which originated about 1928. It grows only four feet tall. It is possessed of vigorous growth; the foliage looks well throughout the entire winter, even though the dark bluish fruits are only sparsely produced. The lowest of these evergreens is the dwarf Magellan barberry, usually under two feet tall. However, it can freeze out or winter-burn some years, even though its native habitat is beside the Magellan

Five species of *Berberis:* 1. *B. verruculosa* 2. *B. triacanthophora* 3. *B. chenaultii* 4. *B. julianae* 5. *B. gagnepainii*



Straits of South America.

A word should be said about the semi-evergreen *B. mentorensis,* a hybrid between *B. julianae* and *B. thunbergii,* which was originated in 1924 by A. V. Horvath of Mentor, Ohio. It has many characteristics of both parents, and has withstood winter temperatures of —20° F without injury. It has deservedly won a reputation in the Midwest, because it is able to withstand the hot dry summers better than almost any other barberry. An old plant of *B. mentorensis* in the Arnold Arboretum is seven feet tall and twelve feet across.

Fortunately for all of us, the Japanese barberry now has many varieties. This plant, first introduced to America in 1875 by the Arnold Arboretum, has widely served many a garden purpose in thousands of gardens throughout the country. Everyone is familiar with its rounded form, thorny branches, bright autumn color, and bright red fruits in the fall. The fruits may remain on the plant all winter long and still be present when the young green leaves appear together with the yellow flowers in the spring. Added to these ornamental features is its ability to grow in poor soil, to withstand shaded situations and drought, to take shearing very well indeed, and to make a serviceable hedge as well as a singularly geometric specimen.

It has become almost too commonly planted, but now varieties are available for those who like to have something a wee bit "different." There is a form *atropurpurea* with reddish leaves a greater part of the summer. A new variety called 'Red Bird', which came out in 1959, is supposed to be of a more brilliant red color and denser habit than *atropurpurea.* There is also an upright form of *atropurpurea.*

Then there is the little 'Crimson Pygmy'; this may also be listed as 'Little Gem' or 'Little Beauty', a plant that originated in Holland before 1952. The eight-year-old plant at the Arboretum is only two feet tall and three feet across. It colors much better in the full sun than it does in the shade, and makes an excellent low border or hedge, which requires practically no attention.

Most gardeners are familiar with the so-called columnberry or upright Japanese barberry *(B. thunbergii erecta)* which originated in Ohio before 1936. It may be of interest to know that our twenty-eight-year-old plant is only five feet tall but ten feet across, with all the branches definitely upright. Then there is the variety called 'Globe', a selection from a nursery in Casstown, Ohio, which was patented in 1936. This is definitely a dense globe-shaped plant—ours is twenty-seven inches tall and four feet in diameter.

One of the most neglected varieties of Japanese barberry is *B. thunbergii minor.* In all its parts—form, leaf, flower, and fruit—it is smaller than the species; it is otherwise like the common plant but of much finer texture and, to my way of thinking, a better ornamental in every way. There are also a "thornless" variety, a variegated-leaved variety, and a yellow-fruited variety, but these are of little interest outside botanical gardens and arboretums.

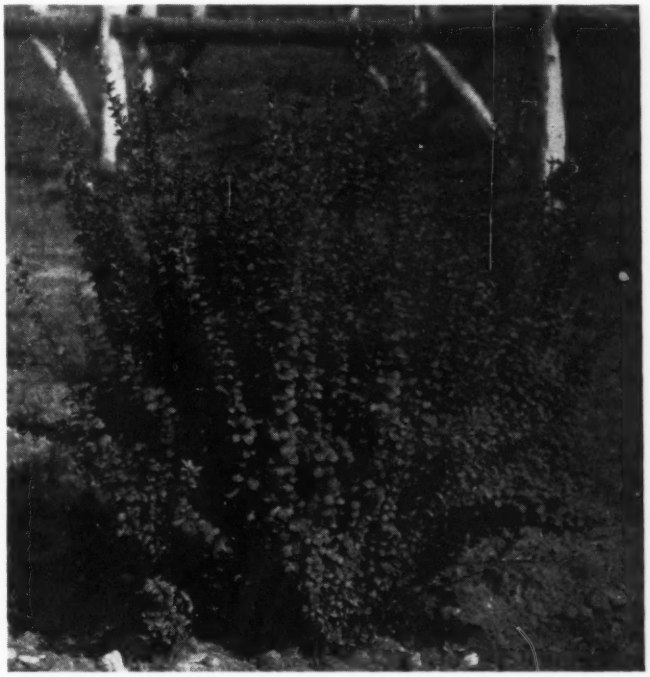
To replace the common barberry *(B. vulgaris),* which is susceptible to the wheat rust, there are two excellent deciduous species which are resistant and can be grown. Both are natives of the Orient, both are vigorous, and both have bright red fruits and fiery red autumn color. The

(Continued on page 138)

Berberis thunbergii minor

Berberis thunbergii nana

Berberis thunbergii erecta



THE BROAD FUNCTION OF A MODERN BOTANICAL GARDEN

By FRITS W. WENT

The following is based on the talk that Dr. Went, Director of The Missouri Botanical Garden, gave at Members' Evening of The New York Botanical Garden on February 28, 1961.

SINCE I am to talk about the broad functions of a botanical garden, my task would be lighter if we all agree on what a botanical garden is. The most general definition seems to me: an extensive collection of correctly labeled, living plants. This collection, of course, should be significant in one way or another, either by being complete or by being rich in special groups or types of plants. Once we have settled on this definition, we should find a reason why we need living plants at all. As a repository of plant species, an herbarium is, at the moment, the generally accepted standard, and a species that is described has to be available in the form of herbarium material rather than as a living specimen. Let us, therefore, see what the function of a botanical garden was in the early days.

The very first botanical gardens were purely for teaching. They were medicinal herb gardens for the training of medical students during the Middle Ages. One of the first such gardens was founded at the Vatican in the thirteenth century. The oldest, still-existing botanical garden is the one at Padova which was founded in the first half of the sixteenth century. Gardens of medicinal plants were essential for the training of a physician in those days. Very little was known about the now generally accepted branches of medicine, and the major function of a physician was to prescribe drugs which were almost exclusively of plant origin. He had to know his plants well, and most professors of medicine were also botanists.

During the sixteenth century some of these physician-botanists grew not only medicinal plants in their gardens, but many other types. Clusius, for instance, brought together an exclusive collection of flowering bulbs at the botanical gardens in Leiden, Holland, which proved to be the beginning of the bulb industry there.

Two factors caused the decline of the old botanical garden which was really a drug or herb garden. One was that drugs became available as standard products, and the physician no longer had to collect them himself; nowadays most drugs are synthetic. But more important was the difficulty of maintaining a complete collection. Whereas in the sixteenth and seventeenth centuries, a botanical garden was essentially a complete living collection of all known plants, this became impossible toward the end of the seventeenth century. At that time travelers were bringing back numerous plants from the tropics, and these plants could not be grown in the colder climates where the study of botany was pursued. Even though greenhouses were invented and improved, they could house only a small portion of the tropical plants that were becoming known; and since most of these were trees, they could not be grown properly. At the same time botanists became aware of the importance of dried plants, which could be stored permanently in a herbarium, and the herbarium thus took over one of the functions of a botanical garden, namely, that of a repository of plant types. Now most of the important botanical gardens have herbariums connected with them.

When in the eighteenth and nineteenth centuries other branches of botany developed—morphology, anatomy, and physiology—the relative importance of the botanical garden as a teaching collection waned. The professor of botany, who was director of the university botanical garden, became more interested in his laboratory and less in the garden. This meant that the chief gardener, or curator *(hortulanus)*, actually ran the botanical garden, and since he was interested primarily in well-grown plants and not especially in botanically important plants, the university botanical garden became a park and a display collection of attractive flowers rather than the original teaching collection of plants.

Simultaneous with the twilight of the botanical garden, the private or estate garden became important. The new merchant-aristocracy in Europe of the eighteenth century lived partly in the country, where gardens were possible, in contrast with the terrible crowding of houses in the city. Not to be outdone by the merchants, the nobility and even kings started to build beautiful gardens around their castles, where the moats were no longer required for security and defense. In many cases these estate, castle, and palace gardens practically became botanical gardens. Thus Kew Gardens were originally the gardens of Kew Palace. The famous Botanical Gardens in Buitenzorg (now Bogor), Java, evolved from the garden of the Governor-General. The Missouri Botanical Garden grew out of the garden of Henry Shaw, a retired St. Louis merchant, and even after one hundred years is still locally known as Shaw's Garden. The most recent among the American botanical gardens, Longwood Gardens, was the estate of Pierre duPont.

This new type of botanical garden has completely revitalized the old type. It is not only a collection for demonstration, research, and teaching, but it has become a service organization. This is the type that fits in our modern society.

Let me detail a few of the functions of the modern botanical garden as I see them from first-hand experience. I shall not list them in order of importance, for I believe that all of them are significant, and all should be more or less equally stressed. At least, we are trying to do this at the Missouri Botanical Garden. It is interesting that, as in the Act of Incorporation of The New York Botanical Garden, Henry Shaw outlined many of these functions, which were included in his will endowing the Missouri Botanical Garden, after he had founded it in 1859. The success and

significance of a botanical garden do not lie in its size, its endowment, the number of plants it contains, or the number of visitors it draws, but in the degree to which all functions are developed, balanced, and integrated. At least that is what I like to think, being Director of a garden that is neither the biggest, nor the best endowed, nor has the largest herbarium, nor attracts the greatest number of visitors. And now for the list:

1. The garden should contain a teaching collection of plants, demonstrating flowering specimens of the different families for the classes that are taught at the garden, for neighboring colleges, and for visitors. This collection should not be too large, for very few persons would work for weeks in the garden to become acquainted with all specimens grown.

2. It should be a repository for limited groups of plants that grow particularly well in the area and cannot be properly studied as herbarium specimens, such as horticultural varieties of crab-apples, roses, irises, azaleas, orchids, or aroids. Such groups can thus be used for intensive study by specialists. Most present-day botanical gardens are doing this, each specializing in certain groups or families of plants.

3. The garden should be attractive to the general public, meaning that all plants should be exhibited in the most beautiful park-like surroundings. Actually, every larger city should set aside one of its parks as a botanical garden under the direction of a trained botanist.

4. The garden should provide demonstrations for the home gardener. At the Los Angeles State and County Arboretum, the home demonstration gardens have proved highly successful, and in many other places the public is visiting such gardens in great numbers. There should be, for example, a city backyard garden, a patio garden, an herb, a fragrance, a Japanese, and similar gardens. In that way the visitor will see the relationship between the large collections of plants present in the botanical garden and his own garden problems.

5. One of the important functions of a botanical garden is the training of gardeners in general. This should be largely a practical training, designed to develop men who can later, either in a botanical garden or on a private estate, take proper care of the various plant materials. At present, hardly any such training is available in the United States, since the courses in horticulture given in high schools and colleges are usually more theoretical than practical.

6. In his will, Henry Shaw suggested that the Missouri Botanical Garden provide training not only for gardeners, but also for students and for the public in general. He established the Henry Shaw School of Botany at Washington University and provided for a close tie between the Missouri Botanical Garden and the School. In the same way The New York Botanical Garden and Columbia University are closely associated. This is important, for in this way the privately or municipally-owned botanical garden can also function as a university botanical garden, of which there are too few in the United States. Classes should be held for both children and adults, which will make it possible to use the rich collections of plants for the education of the public in general. The education of children is particularly important since, at present, the primary schools provide so little biological education. This can very properly be provided by the botanical garden or zoological park.

7. A very obvious and important function of a botanical garden is to serve as an horticultural center, providing information about local growing conditions, the best plants, disease and pest control, and so on. It would also be ideal to have a plant clinic to which persons could bring diseased plants for expert advice and information.

8. Research is the aspect of the botanical garden in which I am most interested. The large collections of living plant materials should be used to increase knowledge of plants in general. Instead of carrying out highly specialized research, which could be done in any botanical laboratory, research in a botanical garden should most logically center around the plant collections. There is another very good reason why a botanical garden should carry out such research. With the unprecedented increase in interest in gardening, as reflected by the enormous growth in the number of garden clubs and in the nursery business, no concomitant increase in research has occurred. The nurseries and garden-supply companies in the United States do several billion dollars worth of business each year, and the lawn and turf grass business, including greens care, approximates ten billion dollars annually. Few organizations and institutions are engaged in problems of the nursery and turf grass businesses; hence a botanical garden is the logical place for carrying out the essential research.

Let me list just a few of the problems that are of special significance to the gardener. a) There is still much to be learned about germination, especially of the horticulturally important plants. b) Problems with the rooting of cuttings and the propagation of plants in general remain as important as ever. c) Any advances in knowledge of plant growth will be helpful to the gardener in general, but advances in knowledge of problems of flowering will be particularly helpful. If we were successful in making plants flower for longer periods of time, or in having them produce more flowers, gardens would be more colorful. There are all sorts of problems in flower biology—opening and closing of flowers, pollination, fertilization—which should command the attention of botanical gardens.

9. Another very important phase in which a botanical garden should take the lead is in plant introductions and in the breeding of new and better varieties of horticulturally important plants. Each area has its own climatic problems; hence each area requires somewhat different varieties for the best results.

10. It seems to me that a botanical garden should be the center for new developments in the general field of greenhouses. The development of the Climatron at the Missouri Botanical Garden is a specific example, and we hope, in our next set of greenhouses, to introduce a number of further improvements both in greenhouse construction and operation.

I should like to close with a brief consideration of the ways in which a botanical garden can be financed. In the first place, there is the possibility that a rich person will establish and endow a botanical garden, as happened with the Missouri Botanical Garden and Longwood Gardens. A limited endowment, however, does not permit growth of the institution beyond what the endowment allows. Op-

erating costs tend to increase more rapidly than does income from such endowments; therefore, and generally speaking, we have to look elsewhere for sources of support.

The second way is by means of tax support, in which each taxpayer bears part of the cost regardless of his interest in the garden.

This difficulty is obviated by a third possibility, namely, the development of operational income from admission fees or other sources. In Europe a number of gardens are financed almost entirely by such operational income. Among these are Tivoli Gardens in Copenhagen and Planten un Blomen in Hamburg. We are presently trying to accomplish such financing at the Missouri Botanical Garden, and the public response has been quite remarkable. It may very well be possible to maintain the public gardens and greenhouses at the Missouri Botanical Garden from contributions by the visiting public. Few people object to a small contribution when they know that it is helping to maintain what they have come to see.

The Climatron at the Missouri Botanical Garden is the first fully climate-controlled geodesic dome greenhouse. It is revolutionary in greenhouse conception, both in design and operation. The dome-shaped structure has a framework of aluminum tubing, supported on a circular concrete base. In the dome the tubing is arranged in hexagonal patterns and is lined with Plexiglas set in triangular mullins which are suspended from the geodesic frame.

Its unique climate-controlled system can produce rain, mist, dry air, and almost any other kind of atmosphere required by the tropical plants that are growing in the Climatron.

Dr. Frits W. Went, Director of the Missouri Botanical Garden, developed the plan for the Climatron with Joseph D. Murphy and Eugene J. Mackey, architects. It is an outgrowth of studies made by Dr. Went while he was professor at the California Institute of Technology. The structure follows principles established by R. Buckminster Fuller, inventor of the geodesic system.

This is the fully climate-controlled geodesic dome greenhouse or Climatron at the Missouri Botanical Garden.

The R. S. Reynolds Memorial Award of $25,000 was formally presented to Mr. Murphy and Mr. Mackey, partners in the architectural firm of Murphy and Mackey, at the convention of the American Institute of Architects in Philadelphia on April 26, 1961. It is the first time American architects have won the award that was established five years ago in honor of the founder of the Reynolds Metals Company. The award, given annually in international architectural competition, is administered by the American Institute of Architects.—THE EDITOR.

THE GENE - 1960 MODEL

The following is based on a transcription of the tape-recording of the informal talk that Dr. George W. Beadle delivered at the President's Dinner during the fifteenth annual American Horticultural Congress, held in Pasadena, California, in November, 1960. Dr. Beadle, Nobel Laureate, was then Acting Dean of the Faculty of the California Institute of Technology. He is now Chancellor of The University of Chicago.

EACH OF US, you and I, started development as a single cell, the fertilized egg, which is almost microscopic. This cell doesn't look very different from a cell that gives rise to a guinea pig, an elephant, a spinach plant, or a corn plant; but somehow it must know what it's going to do, because it doesn't grow into an elephant, it doesn't grow into a guinea pig, it grows into a person. It doesn't grow into just any person, it grows into a very specific person, you or me. And we're all different.

The egg is a spherical cell about three-hundredths of an inch in diameter. The great bulk of it is cytoplasm.* Inside the cytoplasm is a nucleus, and inside the nucleus are chromosomes, forty-six of them. Inside the chromosomes are genes, and these genes collectively carry the information that says what the egg is going to do. And that is what my subject is about.

Because I shall discuss the genetic material that is inside the nucleus of the egg, I don't want you to think that I think the cytoplasm is unimportant. It is definitely not unimportant; it is indispensable. Not only is it indispensable, but it is very specific. No nucleus by itself can develop into an organism. For example, if we take the nucleus out of the egg of a frog such as the grass frog, *Rana pipiens,* and by micro-surgery put into that egg a nucleus from a related frog, *Rana sylvatica,* the egg will not develop. If we per-

*The living matter of a cell is called protoplasm. Part of the protoplasm is organized into a body of definite form, the nucleus. The rest of the protoplasm is called cytoplasm. Editor.

form the reverse transplantation and put *Rana pipiens* into *Rana sylvatica,* it will not develop. These are not compatible. But we can take the egg nucleus from *Rana pipiens* and put it into an enucleated egg of the same species—and it will develop. The cytoplasm must be specific.

We know quite a bit about the form and structure of the cytoplasm. We know quite a bit about how cytoplasmic characteristics are transmitted. We know they are transmitted from generation to generation.

In addition to a nucleus and a cytoplasm, the egg obviously has to have a very specific environment. In our own case (human cytoplasm) there must be a very specific environment both physically and chemically in the early stages. It must be an environment in which raw materials are present because, compared to the egg, we are very large; and in order to get where we are, we have used a lot of raw material which was converted into us. This is the food we eat.

In addition to a physical and chemical environment, and food material, we have another kind of environment which is important, particularly in our species because it makes us different from any other species on earth. We have a cultural environment which feeds information into our brains, where it can be stored, rearranged, and retrieved. This is what our species has accumulated in extra biological knowledge over many, many generations; it is added to and accumulated with every generation. This is the basis for all our culture, religion, art, literature, music, technology, and science, and we are the only species on earth to accumulate cultural inheritance to any significant degree. Each of us has a tremendous store of knowledge in his or her brain.

If you were to write down everything that is stored in your brain, including everything that is in your subconscious mind, how much would it be? You can't even estimate how much. A lot of it is nonsense, but it's still information of one kind or another. There's also a tremendous amount that's part of you, an inseparable part of you; you acquired it in an extra-biological way. It isn't inherited through any set of directions in the egg; it came from the outside.

I want to ask, first of all, how did the information in the nucleus of the egg of a person, or of a carnation, or of a guinea pig get there, and how is it transmitted to the next generation? This is just another way of asking about classical genetics.

My second question is: How are these directions in the egg nucleus written—what is the language of the gene? As a result of quite recent developments, we know quite a little about how these directions are written.

The third question I'd like to consider is: How do we replicate this information with each cell division as it must between the egg of one generation and the egg of another generation? It is quite a feat, for there are fifteen to thirty or more successive replications of all the information that is necessary to make a person out of an egg, given a proper environment and food.

The fourth question is: How do we use this information to convert food into us—how do we make use of these specifications?

And my fifth question: Do these specifications ever change during transmission from one generation to another? This is another way of asking: Do mutations occur?

If I were to give you strips of laboratory filter paper to chew for a few seconds, some of you would be able to taste the phenylthiocarbamide with which the paper is impregnated; others would not be able to taste it. There are not two kinds of paper—there are two kinds of people, because of the different sets of directions in the cells of the egg nucleus.

Each one of us has two parents, so we get two sets of directions or messages. The messages can be of two kinds, so four kinds of people are possible. We can get a message from our mother saying, "I can taste phenylthiocarbamide," and a similar message from our father, in which case we are pure tasters of the substance. We can get a message from our mother saying we can taste and from our father saying we can't. This is another way of expressing that one message is dominant, the other recessive. We are then not pure tasters. We can get a message from our mother which says we cannot taste and from our father which says we can, and again we are not pure tasters. And finally we can get messages from both parents saying that we cannot taste. We are then pure non-tasters.

These messages or directions are written in a code that is actually simpler and more efficient than if they were written in English. It is a four-symbol code.

In the chromosomes of each cell are two kinds of molecules: protein molecules that are made of twenty kinds of amino acids strung together in long chains in various sequences; and molecules that are made of deoxyribonucleic acid or DNA. The latter are long molecules, and the units are of four kinds strung together in various orders. We think that DNA is the significant code—the primary code in carrying hereditary information—because we can transfer genetic specifications to a bacterium through chemically pure DNA. We can throw the protein of the bacterium away, save the DNA, and put this DNA in a new bacterium, causing it to change genetically in a predictable way.

We can do the same with viruses. Some viruses contain the same two kinds of molecules, protein and DNA. One of the smallest DNA viruses (a virus that grows in bacteria) has a single molecule of DNA in its core, which is inside a protein coat. During the infection process this single molecule of DNA enters the bacterial host cell on which the virus grows and the protein coat stays outside, so that the gap between generations of viruses in this case is bridged by a single molecule of DNA. Again, we can throw the coat of the virus away and infect the bacterium with a single molecule of DNA. This tells the bacterial cell how to make more DNA of the kind the virus wants and how to make a protein coat to put around the molecule of DNA and thus make a new virus particle. As many as two hundred daughter viruses may be produced twenty minutes after the infection. In bacteria and in viruses, DNA obviously must carry the direction from one generation to the next. Since we have both these substances in the nuclei of our cells, we are pretty sure that the code in us is written in DNA just as it is in lower organisms.

There are four kinds of units of these long DNA molecules, and we can put them in any order to spell out a message. Actually in most organisms it is a double molecule; the nucleic acid chains are paired to form a double chain somewhat like a ladder. The code then consists of

the sequence in which we put the units together. How many of them do we have in a single cell of our body? In the nucleus of the fertilized egg there are about five billion pairs of units arranged in a specific way. With the amount of DNA in a single human cell, we could write directions for all the organisms, other than man, that have ever evolved on earth, all those that exist now, and all those that are going to evolve, and we would have used only a very small fraction of the total. We would still have enough left—excluding nonsense messages—so that all the two and a half billion people on earth are different. Each one has a different sequence—except for identical twins.

How much information, in more familiar terms, does this amount to? If we were to put the DNA code in the molecules of a single cell into English letters, using an efficient code unit—unit 1 can be the letter A, unit 2 can be the letter B, and so on—and started translating the DNA of a single cell into a book, we would use only one tenth of one per cent for the whole book. With the total DNA of a single cell we could therefore encode about one thousand printed volumes of information.

To give an idea of the miniaturization achieved by this code, I can say that if we were to take DNA and string it out over the head of a pin, one layer thick—back and forth like matchsticks—we would get the whole five feet of DNA on the head of a pin and would have used only one half of one per cent of the head of the pin.

How do we make copies of these instructions? Remember, the egg cell that you started from has the equivalent of one thousand volumes of directions. You're going to reprint these thousand volumes each time a cell divides, and you're going to have to do this successively fifteen or thirty or more times to get from the egg to the egg of the next generation. This is comparable to a typist copying fifteen to thirty thousand volumes—and not making many typographical errors in the process.

How are DNA molecules reproduced? This involves a very special process discovered by Watson and Crick after they had worked out the structure of DNA. DNA is the only large molecule we know of that can direct the synthesis of more molecules like itself. All living things reproduce living things like themselves out of raw material of diverse kinds. People make little people, guinea pigs make little guinea pigs, spinach plants make little spinach plants. DNA is the only molecule that can make little DNA molecules—but the little molecules are the same size as the parental ones. It does so by an exceedingly simple mechanism, so simple it is almost unbelievable. The DNA is a double molecule. Paired with each unit 1, there will always be a unit 2, and with the unit 2 a unit 1, with the unit 3, a unit 4, and with the unit 4, a unit 3. This means that the message of one chain is complementary to that of the other chain. If we know the message in one pair, we shall know the message of the other by this law of complementarity. In other words, one half of the molecule knows what the other half ought to be. During cell division the chains come apart. Each single chain then serves as a template to pick up the units out of which a new chain is made. This we believe is the molecular basis of all biological reproduction.

How do these pieces know that they are supposed to pick up their complements? They know because the chemical structure is such that they will fit only their complements. Is there evidence that this is true? Yes, we can put isotopic labels, for example, radioactive phosphorus, in them in such a way that we can tell an old strand from a new one. In this way we find that they do just what the book says. Or we can supply heavy nitrogen and thereby make heavy DNA molecules in a bacterium. If we grow the bacterium in a heavy nitrogen medium for many generations, all the DNA molecules will become heavy. Now if we let a bacterium with heavy molecules reproduce just one generation in the presence of light nitrogen, the two halves that are heavy will come apart and acquire partners having light nitrogen. We should then have double molecules with one chain heavy and one chain light. They will be hybrid molecules. They will be half way between heavy and light in density. After one more generation in light nitrogen, the hybrid molecules should come apart and construct partners containing only light nitrogen. Therefore, after two generations we should have two kinds of molecules in equal numbers—hybrid and light. Very ingenious experiments show that this is what happens.

This doesn't prove the hypothesis. It just says there's agreement. Nature could find another way of doing it to fool us—if she were unkind. We don't like to think nature would do this, but one must be suspicious as a scientist. Therefore we like to have evidence of an independent kind.

There is in fact such evidence, and it is very dramatic. It comes from the studies of Professor Kornberg and his associates at Stanford University. They have shown that a test-tube solution of four DNA units, in a proper buffer, with magnesium ions and catalytic protein molecules is capable of producing DNA molecules if "primer" DNA molecules are added to the system. Without the primer, nothing happens immediately. But if a few molecules of DNA are added, this DNA starts replicating. This DNA can be of a person, a bacterium, or a virus—it doesn't matter. How can we tell that it behaves in the Kornberg system as it does in our cells? We can tell this if we know the composition—the message in the DNA—that we put in the tube. We can't do this directly, but we can approximate it, because some DNAs have more 1-2 units and other DNAs have fewer 1-2 units in relation to the 3-4 units. We can determine the ratio of 1-2 units to 3-4 units of the primer molecules and see if the product we get has the same ratio. It has. If we drip a low ratio primer in the test tube, we get a low ratio product; if we drop a high ratio primer in, we get a high ratio product.

If the test-tube solution without a primer is allowed to stand long enough under the right conditions, DNA molecules are formed of a kind that are not known to occur in nature. These are DNA molecules that do not contain any 3-4 units. The units are arranged in a strange way—1-2-1-2-1-2- in one chain and 2-1-2-1-2-1- in the other. This is an artificial DNA made spontaneously in the Kornberg test tube. If it is used as a primer in a fresh system, it will immediately start priming formation of more DNA *like itself*. The product DNA will contain no 3-4 units. The Kornberg studies have greatly strengthened the conclusion that DNA replicates as postulated by Watson and Crick.

(Continued on page 138)

DUCKWEEDS IN TEST-TUBES

By WILLIAM S. HILLMAN

Dr. Hillman is Assistant Professor of Botany at Yale University, New Haven, Connecticut. This article is partially based on the talk entitled "Test-tube Studies on Flowering," that was given at the symposium on "Fundamental Developments in Plant Growth" sponsored by the Torrey Botanical Club and AAAS Section G at the December, 1960, meeting in New York of the American Association for the Advancement of Science. Dr. Hillman's own work with the duckweeds, supported by the National Science Foundation, has been concerned with flowering and with red light requirements for growth. Most of the other observations mentioned below are by earlier investigators.

DUCKWEEDS, of no account in horticulture or agriculture, are usually encountered in either of two places: in botany texts, where they are noted as the smallest of the flowering plants, and floating on ponds or quiet lakes, their natural habitat. Here they may make up in numbers what they lack in size. Each plant of the common genus *Lemna* consists of an oval frond less than a quarter-inch across, with a hair-like root an inch or so long; but a few such plants, continually budding off new ones vegetatively, may in a few weeks of summer cover the water with food for ducks and muskrats, and trouble for fishermen.

It has been said, and duckweeds help to prove it, that nothing is truly useless—even from the narrow human point of view (excuding, for instance, that of the ducks). Like the tiny fruitfly *Drosophila,* so valuable for research in genetics, the duckweeds might well have evolved for the benefit of biology. These tiny plants are helping the plant physiologist to ask and answer many questions on topics such as nutrition, flowering, and the various effects of light on growth.

Over thirty years ago it was discovered that single duckweed fronds could be freed from bacteria and algae, by being rinsed in disinfectants, without destroying their ability to produce new fronds when placed on a sterilized nutrient solution. Since each group or "colony"—an older plant with several descendants still attached to it—soon falls apart, aseptic culture can be carried on by transferring small colonies to new solutions, all by standard bacteriological techniques as shown in the first illustrations. These techniques combined with the two most obvious duckweed characteristics, small size and rapid growth, make it possible to conduct experiments that would be difficult or impossible with most other plants.

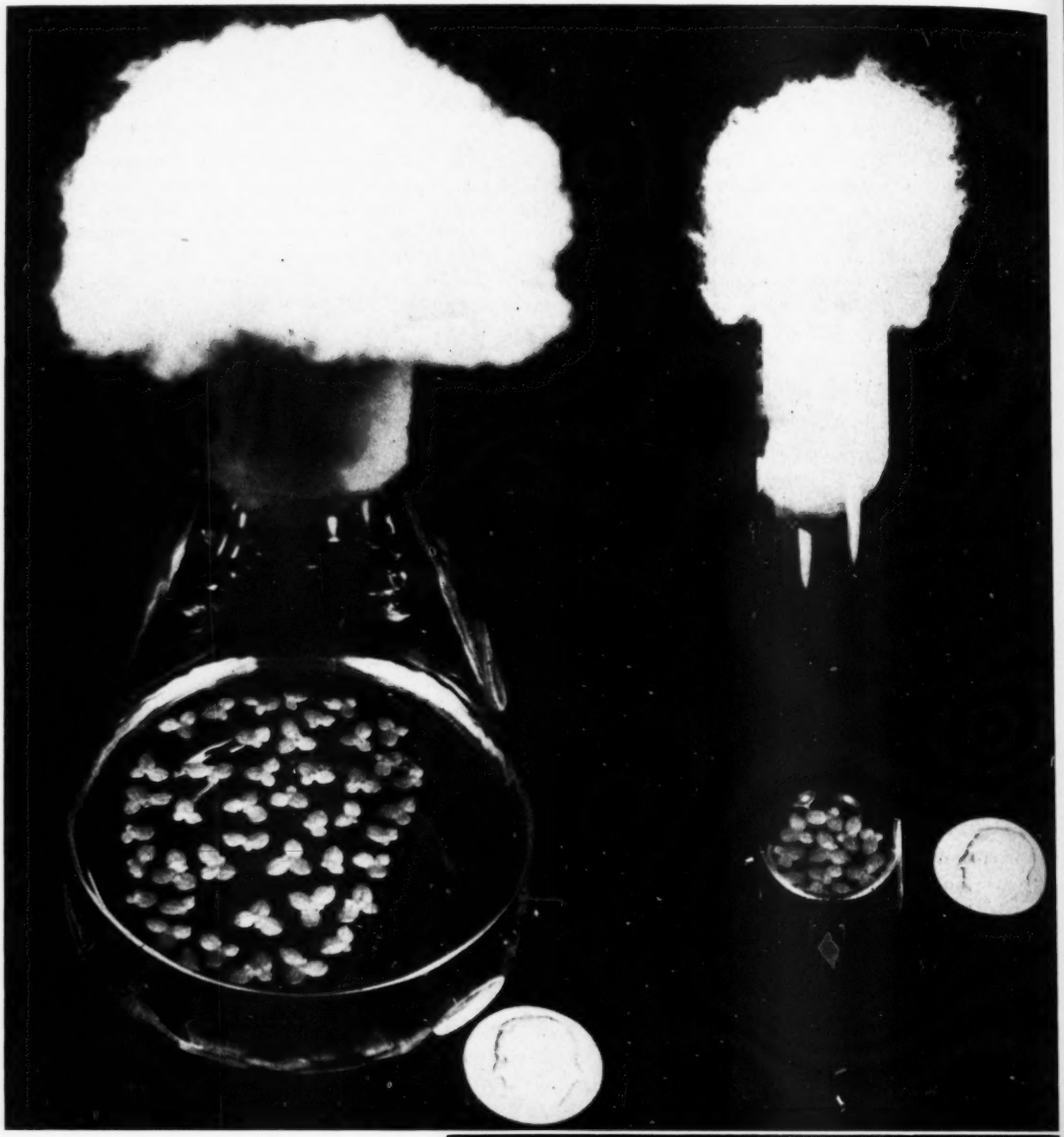
Aseptic cultures can be grown not only on purely mineral solutions, but also in the presence of organic substances such as sugar without fear that the final results may be due to the effects of bacteria or other organisms growing on the organic materials. Another advantage comes from the duckweed's ability to continue indefinitely producing new plants vegetatively in a population, although a particular individual will produce at the most twenty others before it dies. Hence, an infinite number of experiments can be done with plants descended vegetatively from one original plant—a single clone. This procedure gives much less variation than using plants raised individually from seed, since all plants in a clone are genetically identical. There are other advantages of working with aseptic duckweeds. With plants and culture vessels so small, accurate control of light and temperature and the performance of experiments that involve many treatments become much easier than if one were working, say, with tomato plants. And at least one measurement of growth can be obtained without disturbing the plants in any way—by simply counting the number of fronds at various intervals and calculating the rate of increase.

One of the questions that aseptically cultured *Lemna* helped to answer years ago was whether or not plants need traces of organic substances, besides minerals, for normal growth. Some experiments had suggested that they might, since only the addition of manure or peat extracts made normal growth possible in certain nutrient solutions. These effects were interpreted as due to "auximones"—hypothetical compounds believed to be necessary for green plants just as vitamins are necessary for animals and men. A major reason for developing aseptic culture techniques for *Lemna* was that these would make it possible to exclude the small amounts of "auximones" that might be produced by a few bacteria in mineral solutions.

When this was done, in carefully balanced mineral solutions, it became clear that no specific organic substances were required. And *Lemna* plants grown aseptically under entirely inorganic conditions were actually nutritionally superior, as vitamin-sources for animals, to plants grown in media rich with organic supplements.

Notwithstanding this, and similar work with other plants, some advocates of "organic gardening" still seem to support the discarded "auximone" theory of plant growth and plant nutritional values. Further work, again with *Lemna* as well as with other plants, has indicated that when plant growth *is* improved by traces of organic matter, it is because many substances can "chelate" or form complexes with various metallic nutrients. Such chelate complexes, depending on the specific situation, may make the metals either more easily taken up by the plant (as is true of iron) or less so. But such chelating effects are highly unspecific in being exerted by many common compounds, and bear no relation to the hypothetical vitamin-like "auximones."

Let us turn from mineral nutrition to the roles of light in growth and development. One way of studying the effects of light is to exclude it entirely and to try to grow plants in total darkness. Of course, if only minerals are supplied, the plants will soon starve to death; certainly the best known role of light is in photosynthesis, by which sugars, which are both fuel and building material for growth, are



Upper.

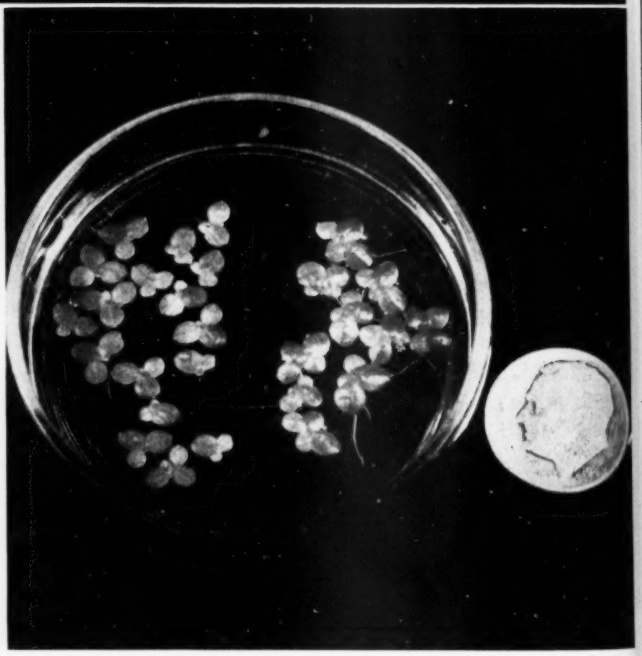
Aseptic cultures of *Lemna perpusilla* in flask and test-tube.

Lower.

Lemna perpusilla (left) and *L. gibba* (right) in a small Petri dish. Note that the right-hand group is composed of forty individual plants, or fronds, grouped in ten colonies.

produced. Light is also required for the synthesis of the chlorophyll that is involved in photosynthesis. But suppose one feeds sugar to the plants; will they then grow in total darkness?

Aseptically cultured duckweeds again provide the easiest test system, and the answer to the question is both yes and no. Certain clones of some species grow almost normally in absolute darkness on mineral solutions supplemented with sugar. Although they are white, rather than green, the size, shape, and growth rate are approximately normal. However, certain other clones die under the same conditions. What other substances do these clones require in order to survive and grow in total darkness? The answer here might indicate what else light does besides supplying energy for photosynthesis. Unfortunately, the results to date are of little help. Some light-requiring clones will indeed grow, very slowly, with yeast extract added to the medium. But yeast extract contains many different chemical compounds, and the particular combination responsible for even this small growth is unknown.



Another way of examining the light-requiring clones is

to see how much and what kind of light they need. This approach draws on work which has been done on other plants to obtain answers to different questions. It has been known for years that most seedlings grown in the dark from seeds that have germinated in darkness develop abnormally, with extremely elongated stems and tiny leaves, before they die of starvation. Although a high light intensity for considerable periods is required to prevent starvation—that is, to satisfy photosynthesis, brief flashes of dim light are all that is needed to prevent this abnormal development (etiolation). In recent years plant physiologists at the United States Department of Agriculture, and elsewhere, have found that the most effective color of light in preventing etiolation is red; further, the effects of a red light exposure are annulled if the plant is then quickly exposed to "far-red" light, of wave-length (7300 Å) just slightly longer than true red (6600 Å). Many other plant processes are also strongly affected by this "red, far-red" system; and in no plant is this more evident than in the light-requiring *Lemna* clones, to which we now return.

In total darkness, on minerals and sugar, the plants stop reproducing vegetatively and soon die. However, less than five minutes of dim red light every few days will permit growth to continue, although the new plants that are produced remain white. A burst of growth follows each light treatment, then the growth rate falls again until after the next. If the red light is followed immediately by far-red (again, for five minutes or less), no growth occurs. But far-red itself causes no permanent damage, since a sequence of brief treatments red, far-red, red gives good growth again. As has been pointed out for other plants, the red, far-red system thus acts like an on(red)—off(far-red) switch. But for these particular *Lemna* clones, it is a switch of life or death.

No single chemical substance has been found that will remove this non-photosynthetic red light requirement. A few of the newer plant growth regulators, including gibberellin, have also been tried, but without success. Kinetin is effective in causing several bursts of growth, but probably not over longer periods. Thus we remain ignorant of what biochemical system is connected and disconnected by the red, far-red switch, although duckweeds may eventually help to identify it.

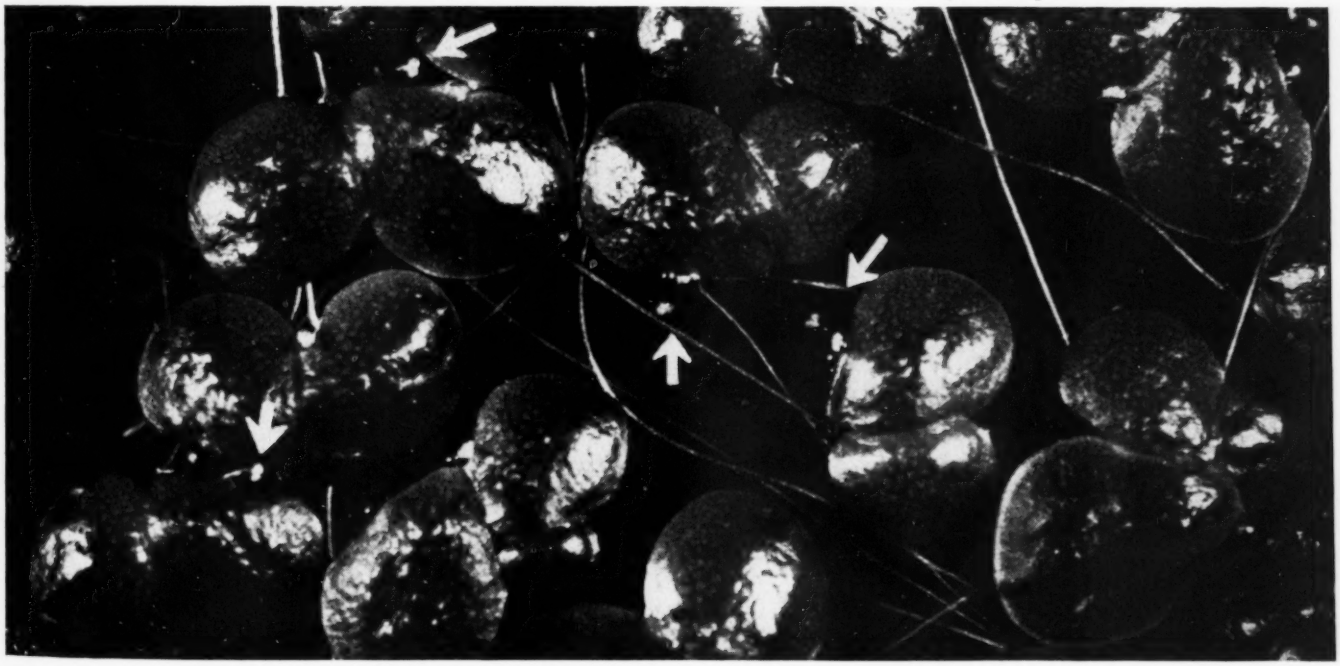
Flowering, representing sexual rather than vegetative reproduction in plants, is also affected by light, through photoperiodism. By photoperiodism is meant the control of reproduction and other aspects of development in many plants (and animals) by the length of the daily exposure to light. Some plants are "short-day" plants—that is, they flower only if given *less* than a certain number of hours of light per day. Many others are "long-day" plants, requiring *more* than a certain number of hours of light per day to set flowers. This "certain number of hours," known as the critical day-length, may vary greatly from plant to plant. Still other plants are entirely indifferent to day-length with respect to flowering, although all are affected by it in some ways.

Short-day plants can also be regarded as "long-night" plants, since flowering in most of them is prevented not only by long light periods, but also by simply interrupting, with a flash of light, a long night which would otherwise lead to flowering. In the same way, long-day plants can be regarded as short-night plants. The discovery that this effect of light flashes was another red, far-red phenomenon—red being the most effective color for interrupting a long night, and far-red annulling the effect of red—has been of great importance in unifying many studies of light effects on plants, and in directing attention toward the underlying physiological processes.

Although photoperiodism has been known for some forty years, the first observation of photoperiodism in a duckweed was published only six years ago by an investigator in West

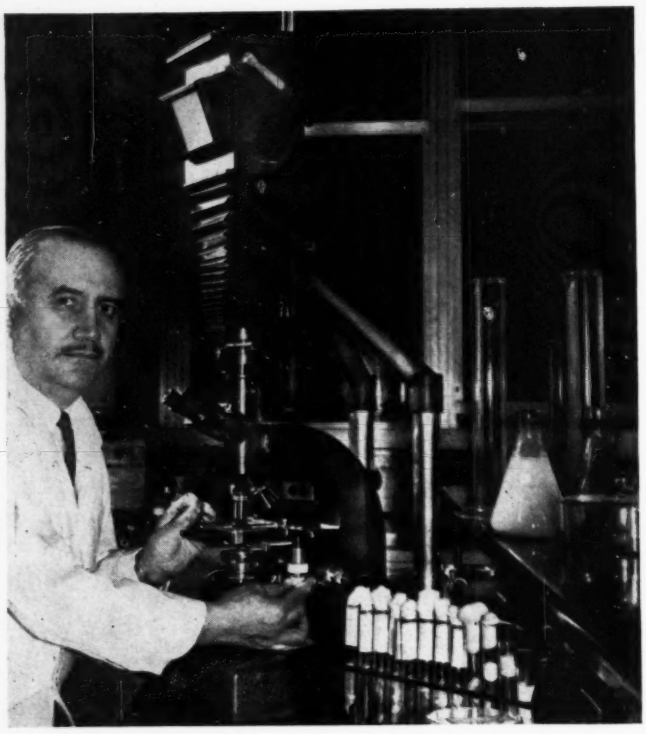
(Continued on page 137)

Magnified view of *Lemna gibba* from above shows flowering. Arrows indicate protruding anthers.



THE PLANT PATHOLOGIST AT THE GARDEN

By DOROTHY EBEL HANSELL



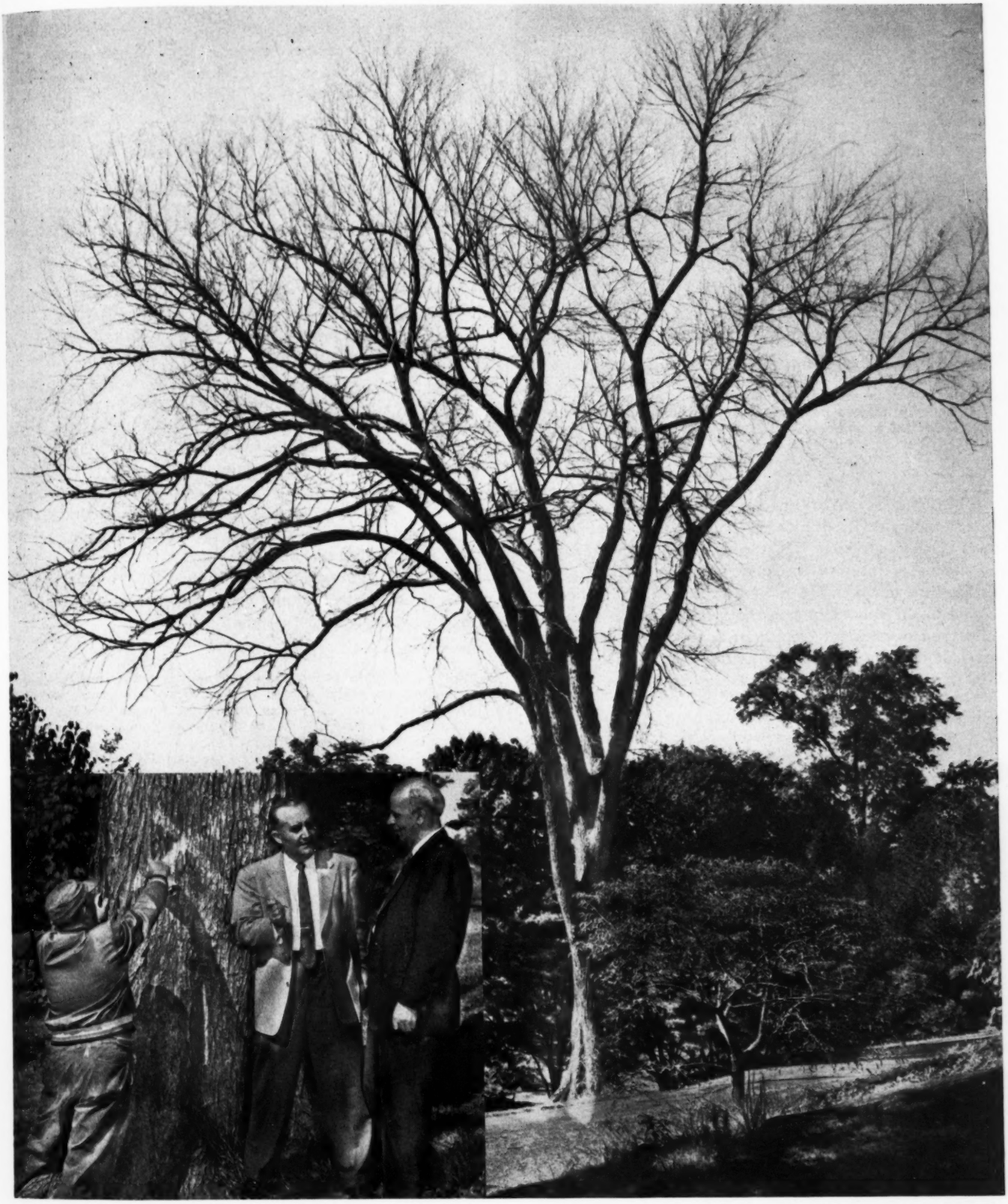
Dr. Pirone adjusts the Leitz microscope and reflex 4 x 5 camera before he takes a photomicrograph of fungus spores. This elaborate apparatus was presented to the Garden by the American Agricultural Chemical Company.

RECENTLY I was asked, "Just what does Dr. Pirone, the Garden's Plant Pathologist, do?" to which I replied, "He looks after the health of the living plant collections. That is quite a responsibility, since there are eight thousand or more different kinds of plants in the Garden, and plants are subject to different diseases just as human beings are. Dr. Pirone takes a sick plant—or the diseased part of a plant—to his laboratory, diagnoses the cause, and prescribes methods of treatment to prevent the spread of the disease. In general, a plant that has succumbed to a disease cannot be cured. It has no circulation of blood—no blood stream—to carry away wastes and to introduce medicines. Dead cells are dead. In other words, Dr. Pirone as a plant pathologist can prevent but not cure plant diseases."

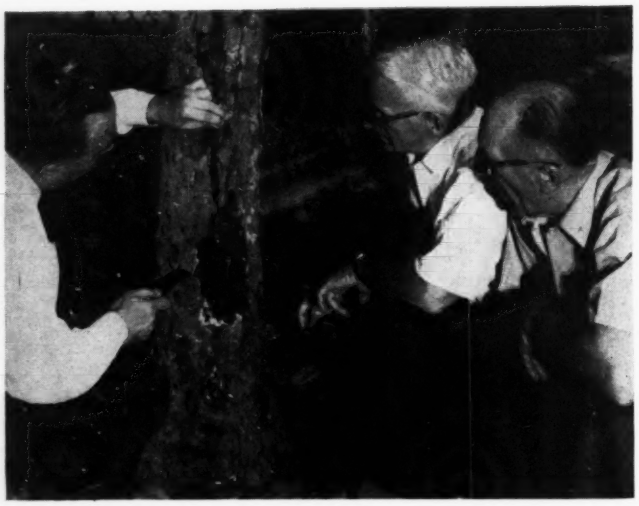
This brief conversation made me pause—to ponder what falls within the province of the plant pathologist at the Garden. Readers of *The Garden Journal* may be interested in learning what my conversation with Dr. Pirone revealed.

Dr. Pirone anticipates and prevents outbreaks of diseases and insect attack by setting up a schedule for regular, periodic spraying. The Montgomery Conifer Collection and the Pinetum, for example, are continually checked for mites and scale. The Rose Garden is sprayed at least twenty times a year. More than twenty-five thousand gallons of spray materials are used in an average season at The New York Botanical Garden. When any tree or shrub on the grounds or any of the tropical plants in the greenhouses show signs that they may be affected by some blight, Dr. Pirone finds out what the trouble is and prescribes accordingly.

Controlling the insects and diseases that may attack the thousands of bushes in the Rose Garden is one of Dr. Pirone's duties. Here he watches as an employee of the Garden applies a combination fungicide-insecticide.



This large elm has succumbed to the Dutch elm disease, despite spraying with DDT, an insecticide which is supposed to kill bark beetles that spread the causal fungus. Insert. Dr. Pirone explains to John Swan, Foreman of the Arboretum at The New York Botanical Garden, how the Dutch elm disease spreads, while Martin Loughlin marks the tree with a large X so that it can more easily be spotted for removal during the winter.



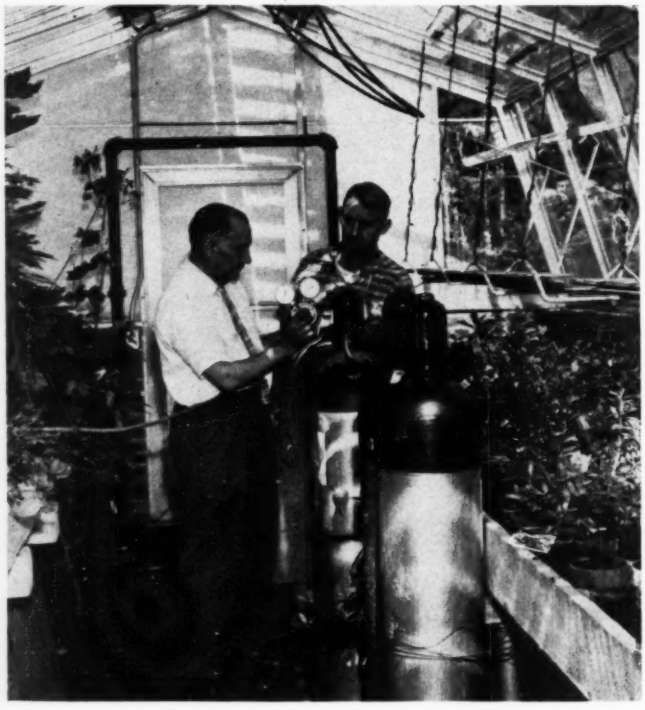
George Griffin, Arboriculturist of the Department of Parks of the City of New York, for the Borough of Queens, (center) and another employee of the Park Department look on while Dr. Pirone cuts away infested bark to uncover the larval stage of the American plum borer. This is a serious pest on London planes in New York City.

Since The New York Botanical Garden does not have an entomologist, Dr. Pirone combats insects as well as diseases. This necessitates his keeping informed in that area as well as in his own discipline of plant pathology. His services are not confined to insects that attack plants but extend to the control of household pests, such as ants, termites, and roaches, for Dr. Pirone comes to the aid of residents of the city as well as assisting the members of The New York Botanical Garden, gardeners, florists, nurserymen, and the Department of Parks of the City of New York. Many of the calls for help come by telephone; others are received by letter from all over the United States, and occasionally some bear the post mark of foreign countries. Answering all these calls consumes quite a lot of the Plant Pathologist's time, but Dr. Pirone also devotes himself to research, investigating the cause and control of diseases of ornamentals, and when no control measure is known, he endeavors to develop one.

Relatively few plant pathologists concentrate their efforts and energy on diseases of ornamentals as compared with those who are concerned with the diseases that afflict cereals, fruits, and vegetables.

Dr. Pirone has a well-equipped laboratory in the Research Laboratory of The New York Botanical Garden, in which he carries out his studies and investigations. Just as the medical doctor examines his patients, studies their histories and symptoms, before deciding what treatment and medicine to prescribe, so does the Plant Pathologist. He must be familiar with the many diseases to which plants are susceptible—from the brown patch on lawns, the nematodes that infest chrysanthemums, the mildew that troubles lilacs and roses to the destructive and widespread Dutch elm disease *(Ceratocystis ulmi)*. Plant diseases are caused by fungi, bacteria, viruses, and nematodes, and the plant doctor must be able to recognize the symptoms that are brought on by these different agents in order to recommend the proper remedy. He has a whole arsenal of chemicals at his disposal, but he must know the specific chemical that is effective against a specific problem.

Dr. Pirone checks the flow of natural gas from tank to the roots of young trees that are being subjected to this substance, as John Walther, a Garden employee, stands by.



The branch of a young Norway maple is being inoculated with a fungus originally isolated from a dying tree on a New York City street. After Dr. Pirone inserts the fungus into the wound made with a sharp scalpel, he covers the fungus with moistened cotton and then with aluminum foil. If the fungus is a parasite, the branch will soon be invaded and will die within one to three months.

The first large-scale tests on feeding shade trees through their leaves were conducted by Dr. Pirone in cooperation with the Department of Parks of the City of New York. Dr. Joseph Kuc, second from the left and presently a professor at Purdue University, was Dr. Pirone's assistant in this pioneer work.

In recent years Dr. Pirone has conducted research on the effects of natural gas on plants, of gibberellic acid in accelerating plant growth, of maleic hydrazide in retarding plant growth. Dr. Pirone was the first to report on the use of maleic hydrazide in retarding growth on California privet. He was also the first to ascertain that through air-layering roots can be made to develop on the stems of the London plane within three weeks. This finding was important, because the London plane is one of the most extensively planted trees on the streets of large cities. In earlier years, in cooperation with the Department of the City of New York, Dr. Pirone successfully carried out investigations on foliar feeding. These were the first large-scale tests of feeding plants through their leaves.

This spring Dr. Pirone, also in cooperation with the City's Park Department, started an investigation of the cause of a blight that has made its appearance on *Gingko biloba* in various sections of New York City during the past year. The disease is accompanied by scorching and browning of the leaves. While the Park Department has five arboriculturists—one for each of the Boroughs—it does not have a plant pathologist on its staff. So the Garden's Plant Pathologist is frequently called upon to assist in diagnosing diseases and in recommending treatment.

Dr. Pirone, on his own time, serves as a consultant to the United Nations, to General Foods, to members of the American Gas Association. He contributes to magazines and newspapers, and is author of *Modern Gardening, What's New in Gardening, Tree Maintenance,* and co-author with the late B. O. Dodge and Harold William Rickett of *Diseases and Pests of Ornamental Plants.* The third edition of *Diseases and Pests of Ornamental Plants* was completely revised by Dr. Pirone for publication by The Ronald Press in 1960.

DUCKWEEDS (from page 133)

Berlin. Since that time, I have devised methods for rapid and accurate experiments on the photoperiodic control of flowering in several species of *Lemna.* If this work succeeded only in demonstrating already well-known phenomena under elegant, aseptic conditions, it would not be of more than passing interest. However, it seems to provide new tools toward the investigation of photoperiodism and perhaps the red, far-red switch as well. But before discussing the results, it would be well to digress for a moment to consider what flowering in a plant as tiny as *Lemna* means.

The duckweeds are true flowering plants (angiosperms) in good standing, but the flower, in common with other structures of these plants, is reduced practically to the bare essentials. It consists of two stamens and a single pistil, and each frond bears only a single flower in its lifetime. Several of these gorgeous blossoms are shown, highly magnified, in the second illustration (of *Lemna gibba,* one of the larger species). In experimental practice, one does not even wait for the external emergence of the flowers. Cultures are started with a single non-flowering colony (three or four fronds) and allowed to grow for six to eleven days under the various conditions to be studied. By this time each flask or tube contains forty to eighty fronds. Under a low-power microscope, each frond is rapidly cut to see whether or not it contains a young bud, and the percentage of the total number containing buds is used as a measure of the intensity of flowering. Under some conditions, values of seventy per cent or over can be attained in a week. This, then, is the basic form of the experiments.

The most interesting results so far, shorn of a history of fumbling experimentation, are easily summarized. Clones of two species, *Lemna perpusilla* and *Lemna gibba,* showed very different flowering behavior when they were growing in a standard mineral solution, or in that solution with sucrose. *L. perpusilla* flowered in all day-lengths, while *L. gibba* did not flower in any. Then it transpired that the addition of any of several strong chelating compounds—for example, the widely-used "versene" (EDTA)—altered the responses of both plants. *L. perpusilla* became a strict short-day plant, flowering best with ten hours of light per day or less; *L. gibba* was made to flower as a long-day plant, with sixteen or twenty-four hours of light per day, but not, for example, with eight.

Here were two plants that under the original conditions did not show photoperiodism. The addition of chelating agents, known to affect the biological activity of many metals, made both of them photoperiodic, though in different ways. One explanation might be that in the first condition certain metals were present that inhibited photoperiodism, even though the plants grew well. This guess now seems more than a guess; with special care taken to purify the water and other substances used, these plants appear photoperiodic even in the absence of the chelating agents. Further, various metals can now be tested by adding them back to such purified solutions. At least two, copper and mercury, appear to be relatively specific inhibitors of photoperiodism. That is, in minute amounts (less than one part per million) they prevent the response to day-length but have little effect on general growth processes under these conditions.

These observations—if further research confirms them—should help advance our understanding of photoperiodism, since specific inhibitors for a process often make it possible to determine its underlying mechanism. Besides its interest in terms of fundamental biology, such understanding will eventually have great practical consequences, leading to a greater control over all aspects of plant growth than any now possible.

These are some of the ways in which duckweeds have helped and are helping botanists to learn about the growth and development of all plants. Whether every single observation made with these plants will apply directly to the more familiar plants that feed or clothe us, or give us pleasure, is uncertain. But there is little reason to doubt that, by and large, the basic processes are similar in all species. It is the rapidity, convenience, and accuracy with which these processes can be studied that has given the duckweeds a third habitat besides the botany textbook and the quiet lake—the shining glassware of the modern physiology laboratory.

BARBERRIES (from page 125)

Korean barberry (it comes from Korea as its name indicates) grows about eight feet tall, and has arching branches and pendulous clusters of rounded fruits. This worthy plant is being grown by several nurseries.

The other, *B. gilgiana,* popularly called the wildfire barberry because of its red autumn color and bright red fruits, is a native of western China. Introduced for the first time by the Arnold Arboretum in 1910, it has been of interest only during the last few years when people have become convinced that they should not grow the rust-carrying barberries. Our original plant, still a perfect specimen after fifty years of growth, is ten feet tall and ten feet in diameter. Unfortunately it was listed by only one nursery in the last edition of *The Plant Buyer's Guide.*

These, then, are the most important of the many barberries to be considered for lower New York. Certainly the novelty of the group has worn thin, but recent varieties are adding interest to it. Also, with more and more emphasis being placed on "low plants" and "low-maintenance gardening," where can the home owner find such an interesting, diversified group as the barberries, requiring no pruning and no spraying for pest eradication? Ponder that one!

THE GENE (from page 130)

How is DNA information translated? This appears to occur by way of another kind of nucleic acid called RNA (ribonucleic acid). Ribonucleic acid is made of 4-units and is believed to be constructed by using DNA molecules as templates by a direct copying process. The resulting RNA molecules are then thought to move from the nucleus to the cytoplasm, where they are incorporated in submicroscopic structures called ribosomes. There they presumably serve as templates against which amino acids are put together to make proteins. Perhaps I can use an anælogy that will make this understandable. RNA is a kind of information tape, much as a street with a series of houses is an information tape for the use of the mailman. The mailman has a bundle of letters with house numbers on them, and he delivers the letters to the houses with corresponding numbers. The amino acids do the same. Small pieces of coding RNA molecules are attached to the twenty kinds of amino acids. Each kind of amino acid has its own RNA code. These tagged amino acids then move along the RNA "street" until they come to the proper RNA "house" number. In this way they find a proper sequence just as the postman lines letters up in proper sequence along the street. Properly aligned, they are joined through peptide linkages to form proteins. Hemoglobin protein molecules, for example, contain six hundred amino acids each, arranged in a specific way designated by DNA.

What about mistakes? They are like typographical errors. DNA is an interesting molecule in the sense that it doesn't care what information it contains—it will replicate faithfully whether its information makes people, rabbits, or nonsense. When the instructions come out wrong, the individual who carries them is likely to be biologically less fit; that is, in a statistical sense, produces fewer than the average number of reproductively effective offspring. Over a larger or smaller number of generations such lines of descent disappear. This is what we call natural selection. This is somewhat like a typist with a monitor—throwing away all the copies that carry mistakes.

There are favorable changes in DNA as well as unfavorable ones in the above sense. The unfavorable ones are eliminated by natural selection; the favorable ones are pref-

Berberis gilgiana

erentially multiplied and replace the original. In this way we get new kinds of people, new kinds of spinach plants, new kinds of carnations. This is believed to be the basis of all organic evolution. One important point I wish to make is this: mutations, like typographical errors, are not good or bad in an absolute sense. Thus, if in typing the word *now,* I change the "w" to "t", I get *not. Not* may be a good word or a bad one, depending on the context. This is true with DNA messages in much the same sense. Genes are not good or bad in any absolute sense, but only in terms of the context. And there are two kinds of contexts for instructions for development—a genetic context and an environmental context.

Let me illustrate the environmental context. A hemoglobin molecule contains six hundred amino acids put together according to DNA instructions. The DNA instructions are sometimes altered. In one of these altered forms they specify a valine instead of a glutamic acid in two homologous positions in the molecule. The result is S-hemoglobin. If one has S-hemoglobin, the result is likely to be fatal, for blood cells containing only S-hemoglobin have a short life and the oxygen carrying capacity of the blood is dangerously reduced. If one has instructions for both normal and S-hemoglobin, the result is that both kinds of hemoglobin are present in each red blood cell. In this case the result is only slightly disadvantageous. One can say that the gene specifying S-hemoglobin is an unfavorable one. However, if one lives in a part of equatorial Africa where malaria is present, having a fifty-fifty mixture of normal and S-hemoglobin appears to be advantageous, for such persons seem to be more resistant to malaria than are persons with all-normal hemoglobin. The answer to the question, is the gene that specifies S-hemoglobin unfavorable, clearly depends on the environment.

A gene that makes a bacterium resistant to penicillin is favorable to the bacterium as long as the penicillin is present in the environment. But if no penicillin is present, the same gene is unfavorable, for the bacterium that carries it reproduces less rapidly under such conditions than do its relatives that are susceptible to penicillin. Again, whether the genetic message is good or bad depends on the environmental context. Other examples show equally clearly that the genetic context, too, may be decisive.

BOOK ORDERS

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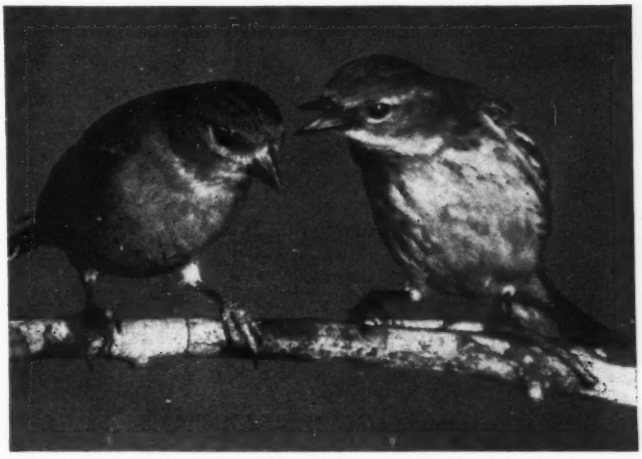

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BRIEF NOTES ON RECENT BOOKS

By ELIZABETH C. HALL

Miss Hall is Sarah Gildersleeve Fife Research Librarian of The New York Botanical Garden.

FRUITS, VEGETABLES, HERBS AND NUTS

A FRESH HERB PLATTER. Hogner, Dorothy Childs. 237 pages, illustrated, indexed. Doubleday and Co., Garden City, N. Y. 1961. $3.95

Nothing dull about this bonanza for the gourmet. Mrs. Hogner knows intimately the idiosyncrasies of the herbs she grows and writes about so vividly. The attractive planting plans and diagrams for combination vegetable, herb, and salad bowl gardens are intriguing. The flavor charts, recipes, and instructions for freezing and drying are all excellent.

THE HERBALIST; MEDICINAL PLANTS, PLANT VITAMINS AND MINERALS, BEVERAGE TEAS, SPICES, AND FLAVORING HERBS; 4th ed. Meyer, Joseph E. 304 pages, illustrated (part colored), indexed. Indiana Botanic Gardens, Hammond, Ind. 1960. $3.00

The first edition of *The Herbalist* appeared in 1918—a pocket-sized affair, chuck full of assorted herb lore. This greatly revised and enlarged edition is still a delightful miscellany of herbal uses. To be read and consumed with discretion.

HERBS AND THE EARTH. Beston, Henry. 117 pages, illustrated, indexed. (Dolphin Books) Doubleday and Co., Garden City, N. Y. 1961. 95 cents.

A reappearance in paperback of a much-loved little book which has been too long out-of-print. The author, a master gardener as well as a philosopher and poet, writes of his beloved herbs with great charm.

HOW TO GROW VEGETABLES AND FRUITS BY THE ORGANIC METHOD. Rodale, J. I. and staff of Organic Gardening and Farming Magazine. 926 pages, illustrated, indexed. Rodale Books, Emmaus, Pa. 1961. reg. ed. $7.95: deluxe ed. $12.50

Contains a vast quantity of information on the growing (the organic way) of vegetables, herbs, fruits, and nuts, including tropical and subtropical kinds. Directions given for cooking, freezing, storing. Vitamin contents noted.

THE MEDICINES OF NATURE; THE THOMSONIAN SYSTEM. Clymer, R. Swinburne. 205 pages, indexed. Distributed by Philosophical Publishing Co., Quakertown, Pa. 1960. $4.00

A new edition of a work originally published in 1905 and revised in 1926. The present edition "issued by popular demand with no profit to the Author." Reasons for renewed interest in once discarded common remedies are stated at some length in the Prologue.

THE SIMMONITE-CULPEPER HERBAL REMEDIES. Simmonite, William Joseph and Culpeper, Nicholas. 123 pages, colored front., indexed. Sterling Publishing Co., New York. 1961. $2.95

A selection of the herbal remedies of the seventeenth century astrological physician Nicholas Culpeper and of the twentieth century professor of medicine Dr. W. J. Simmonite. A prefatory note reads: "Reference in the text to the planetary rulers of the herbs will be of interest to those readers who are acquainted with the science of Astrology. Other readers need not observe them."

VEGETABLE GARDENING. Editorial staffs of Sunset Books and Sunset Magazine. 72 pages, illustrated, indexed. Lane Book Co., Menlo, Cal. 1961. $1.50

Clear directions for growing vegetables and herbs in all climates based on U S D A weather records of average hard-frost dates. Planting procedures are well illustrated with pictures and diagrams. Useful space-saving ideas include tub and box gardens. Tempting suggestions for cooking, seasoning, and serving.

HOUSE PLANTS AND GREENHOUSE CULTURE

GREENHOUSE GARDENING AS A HOBBY. Crockett, James Underwood. 288 pages, illustrated (part colored), bibliography, indexed. Doubleday and Co., Garden City, N. Y. 1961. $4.95

Written by an enthusiastic greenhouse hobbyist with a good technical background. Directed towards the needs of the amateur with advice on "do-it-yourself" construction, air conditioning, and heating. Helpful calendar of sowing, planting, and flowering dates.

MODERN INDOOR GARDENING INCLUDING WINDOW BOXES. Gardiner, G. F. 150 pages, illustrated, indexed. St. Martin's Press, New York, 1961. $4.50

Mr. Gardiner, formerly curator of the botanic gardens in the University of Bristol, England, has written primarily for British gardeners, using British terms and proprietary names. For us there are far more useful American publications on house plants.

ORCHIDS; THEIR BOTANY AND CULTURE. Hawkes, Alex D. 297 pages, illustrated (colored front.), indexed. Harper and Brothers, New York. 1961. $6.95

Beginner and veteran orchid grower should find helpful material here. There are chapters on the morphology, physiology, and classification of orchids; on the mechanical operations in cross-pollination; on growing orchids from seed and the care of seedlings. Cultural instructions are given for specific groups; eighty-seven of the genera described are illustrated by photographs or line drawings.

PALMS. Muirhead, Desmond. 140 pages, illustrated, bibliography. Dale Stuart King, Globe, Arizona, 1961. paper ed. $1.95: cloth ed. $3.20

A popular, liberally illustrated treatment of palms and a few palm-like plants with descriptive, cultural, and design notes, by a landscape architect and city planner. Specifically directed to residents of warm or sub-tropical areas.

GENERAL GARDENING

ATOMIC GARDENING. Howorth, Muriel. 75 pages, illustrated, indexed. Distributed by Rogers Book Service, New York. 1960. $3.50

Sponsored by the Atomic Gardening Society, Eastbourne, London, this is the first book on atomic gardening for the layman. Directions are given for managing an atomic-energized experimental garden accompanied by a control garden.

CAREFREE GARDENING; NEW AND EASIER WAYS TO HAVE AN ABUNDANCE OF FLOWERS AND VEGETABLES. Hersey, Jean. 191 pages, illustrated, indexed. D. Van Nostrand Co., Princeton, N. J. 1961. $4.95

According to Mrs. Hersey, there are many kinds of plants that require a minimum of care, and there are numerous short cuts and techniques in gardening and garden design. With a sprightly, informative text she offers freedom to the "garden slave."

THE COMPLETE BOOK OF COMPOSTING. Rodale, J. I., and staff of Organic Gardening and Farming Magazine. 1007 pages, illustrated, indexed, bibliography. Rodale Books, Emmaus, Pa. 1960. $6.95: deluxe ed. $11.00

The fundamental principles of organic gardening are based on composting. In this voluminous work are chapters on history, equipment, numerous methods used in this country and abroad, and the benefits from this type of gardening.

ENCYCLOPEDIA OF GARDENING. Whitehead, Stanley B. Rev. from Walter P. Wright. 787 pages, illustrated. C. T. Branford Co., Newton Centre, Mass. 1960. $5.00

The present compact and comprehensive volume is a thoroughly revised edition of Walter P. Wright's *Everyman's Encyclopedia of Gardening*, written for the English gardener over a quarter of a century ago. Because great differences exist between horticultural techniques and climatic conditions in North America and Great Britain, this text will have small value here.

GARDENING THE EASY WAY; THE HOMEOWNER'S COMPLETE GUIDE TO GARDENING. Steffek, Edwin F. 198 pages, illustrated indexed, bibliography. Holt, Rinehart and Winston, New York, N. Y. 1961. $3.95

The title is deceiving. Is gardening ever "easy?" The Horticultural Editor of *Popular Gardening* has assembled for the inexperienced gardener considerable information on many types of gardening, with good lists for exacting conditions of city, seashore, and mountain.

GARDENING WITHOUT WORK FOR THE AGING, THE BUSY AND THE INDOLENT. Stout, Ruth. 214 pages, illustrated, indexed. Devin-Adair Co., New York. 1961. $3.95

The "unsinkable" Ruth Stout, organic gardener, par excellence, not satisfied to rest on the laurels already won by her *How to Have a Green Thumb Without An Aching Back* (1955) has further developed her famous mulching treatment with "no plowing, no hoeing, no cultivating, no weeding, no watering, no spraying."

A JOY OF GARDENING. Sackville-West, V. 199 pages, indexed. (Dolphin Books) Doubleday and Co., Garden City, N. Y. 1961. 95 cents.

Paper cover edition of title published in 1958.

The original material appeared in England in the books *In Your Garden Again* and *More for Your Garden*. Delightful writing edited for American gardeners by Hermine I. Popper.

LANDSCAPE AND URBAN PLANNING AND GARDEN STRUCTURES

CAPITAL REQUIREMENTS FOR URBAN DEVELOPMENT AND RENEWAL. Dyckman, John W. and Isaacs, Reginald R. 334 pages, indexed. McGraw-Hill Book Co., New York. 1961. $13.50

A thorough analysis of the economics of urban development and renewal by two outstanding authorities in the field of city and regional planning. Detailed cost estimates provide invaluable information. This is an important contribution on this subject.

HOW TO BUILD FENCES AND GATES; revised and enlarged ed. 112 pages, illustrated. (A Sunset Book) Lane Book Co., Menlo Park, Cal. 1960. $1.75

A practical "do-it-yourself" manual, generously illustrated with photographs, plans, and diagrams.

LANDSCAPE ARCHITECTURE; THE SHAPING OF MAN'S NATURAL ENVIRONMENT. Simonds, John Ormsbee. 244 pages, illustrated, indexed. F. W. Dodge Corporation, New York. 1961. $12.75

The author, an eminent landscape architect, is currently teaching landscape design and urban and regional planning at Carnegie Institute of Technology. In this profusely illustrated quarto, he stresses the importance of forms, forces, and features of natural and man-made landscapes in his discussion of the basic fundamental principles of landscape design.

SUNSET PATIO BOOK; revised ed. Editorial staffs of Sunset Books and Sunset Magazine. 166 pages, illustrated. Lane Book Co., Menlo Park, Cal. 1961. $2.00

Although slanted to the needs of Pacific Coast residents, this new edition, with well-written text and exceptionally fine photographs, will inspire gardeners in other areas.

ART, FLOWER ARRANGEMENTS, AND HOLIDAYS

ARRANGING FLOWERS FOR THE SANCTUARY. Patterson-Knight, Francis and St. Claire, Margaret McReynolds. 126 pages, illustrated, indexed, bibliography. Harper and Brothers, New York. 1961. $3.50

Both authors, accredited flower show judges, have had years of experience in church flower arrangements. So many angles have been considered, such as symbolism, subdued light, expense, Bible gardens, church calendars, and containers. A valuable contribution.

ART PRINCIPLES OF FLOWER ARRANGEMENT. Wilson, Clarice T. 111 pages, illustrated (part colored). National Council Books, Philadelphia, Pa. 1961. $5.00

A former officer of the Garden Club of South Carolina and a nationally accredited judge writes of the importance of the principles that go to make up good design as applied to flower arrangements. She devotes separate chapters to form, line, color, texture, selectivity, scale, dominance, rhythm, contrast, proportion, and balance. She touches briefly on judging and period and modern arrangements.

COLOR HARMONIES WITH DRIED FLOWERS. Capen, Barbara M. and McChesney, Marie Louise. 22 pages, illustrated. Floral Fancies, Box 605, Bellport, N. Y. 1960. $1.50

Selection and techniques of drying are well covered in this little booklet by two Long Island women, who run a commercial flower shop that specializes in dried arrangements and unusual containers.

THE COMPLETE BOOK OF WEDDING FLOWERS AND DECORATIONS WITH A SECTION ON ETIQUETTE. Clark, Virginia. 160 pages, illustrated (part colored), indexed. Hearthside Press, New York. 1961. $5.95

Readers of the *Florists' Review* are acquainted with the helpful articles of Mrs. Clark who owns (with her son) a successful flower shop in Iowa. She previously wrote a florists' instruction trade book entitled *Servicing Weddings*. This new offering has a wealth of material including directions for making corsages, bouquets and boutonnieres, and floral decorations for home, hotel, church, and garden weddings.

FLORAL ART FOR PLEASURE. Bunbury, Alice. 20 pages, 55 plates (part colored). Charles T. Branford Co., Newton Centre, Mass. 1961. $5.00

Mrs. Bunbury writes of her own arrangements of flowers that she has grown in her garden in Australia.

FLOWER ARRANGEMENT IN COLOR. Stevenson, Violet. 71 pages, colored illustrations. (A Studio Book) Viking Press, New York. $2.98

From England comes this title written by a flower arranger and author extremely popular in her own country and abroad.

CONSERVATION, NATIONAL PARKS, SCIENCE PROJECTS, ETC.

CAREERS AND OPPORTUNITIES IN SCIENCE; A SURVEY OF ALL FIELDS; new revised ed. Pollack, Philip. 194 pages, illustrated, indexed, bibliography. E. P. Dutton and Co., New York. 1960. $3.95

First edition published in 1945 under the title *Careers in Science*. Useful information on current salaries, lists of colleges and universities, courses available in the Armed Forces. Opportunities for women also evaluated.

FOOD FOR AMERICA'S FUTURE; TWELVE OUTSTANDING AUTHORITIES DISCUSS THE COUNTRY'S ABILITY TO FEED ITS MULTIPLYING MILLIONS. Ethyl Corporation. 167 pages, illustrated. McGraw-Hill Book Co., New York. 1960. $3.95

Excellent brief chapters by eminent men in the fields of soil science, food economics, agricultural research, genetics, physics, and chemistry. "Will America be able to feed its 245 million people in 1975?" The answer from these contributors is an unanimous "yes".

FERNS

THE FERN GUIDE; NORTHEASTERN AND MIDLAND UNITED STATES AND ADJACENT CANADA. Wherry, Edgar T. 318 pages, illustrated, indexed, bibliography, (Doubleday Nature Guides Series) Doubleday and Co., Garden City, N. Y. 1961. $3.95

Over twenty years ago Dr. Wherry published *A Guide to Eastern Ferns*, which was revised in 1942. The present volume covers a much larger region than the previously published work, with descriptions and plates of 135 species of ferns and fern allies. Features, range, habitat and culture in the garden are noted. An analytical key and glossary of technical terms are helpful adjuncts. A comprehensive, authoritative, pocket-size manual.

HOW TO KNOW THE FERNS; A GUIDE TO THE NAMES, HAUNTS, AND HABITS OF OUR COMMON FERNS; 2nd ed. Parsons, Frances Theodora. 215 pages, illustrated, indexed. Dover Publications, New York. 1961. $1.25

To the Dover Publications thanks are due for giving to us again another old-time favorite, first published in 1899 and long out-of-print. Many of us learned our ferns from Mrs. Parsons, and although nomenclature has changed during the past fifty years her informal observations are still very useful for the beginner.

ECOLOGY

HEATHLAND ECOLOGY. Friedlander, C. P. 94 pages, illustrated, bibliography, indexed. Harvard University Press, Cambridge, Mass. 1961. $1.75

The heaths of southern England have been the outdoor classroom of this teacher, who has written of the flora and fauna and geology from practical observations in the field.

MAN IN NATURE. Bates, Marston. 116 pages, illustrated, bibliography, indexed. (Foundations of Modern Biology Series) Prentice-Hall, Englewood Cliffs, N. J. 1961. paper bound, $1.50; cloth, $2.95

A brief history of man's changing relations with nature by a well-known authority, who is endowed with the ability to write lucidly on the many phases of science that have affected man through the ages.

WESTERN FOREST INDUSTRY; AN ECONOMIC OUTLOOK. Guthrie, John A. and Armstrong, George R. 324 pages, maps, illustrated, indexed, bibliography. Johns Hopkins Press, Baltimore, Md. 1961. $6.50

Published for Resources for the Future, Inc. Up-to-date data on the forests and forest industries of the Pacific Slope. Statistical tables through 1959 of lumber production and consumption. Recommendations for sustained-yield operation.

INSECTS

COMMUNICATION AMONG SOCIAL BEES. Lindauer, Martin. 143 pages, illustrated, bibliography, indexed. (Harvard Books in Biology no. 2) Harvard University Press, Cambridge, Mass. 1961. $4.75

According to the experimental results of Dr. Lindauer and of his former teacher and present

colleague, Professor Karl von Frisch, bees have a "language" by which they communicate with one another. There are chemical, optical, and mechanical signals. An entertaining subject presented in a popular style.

INSECT LIFE AND INSECT NATURAL HISTORY; 2nd ed. Frost, S. W. 526 pages, illustrated, indexed, bibliography. Dover Publications, New York. 1959. $2.25

This new edition, first published in 1959, is a revised version of the work formerly entitled *General Entomology*. A textbook for elementary college entomology. The author is Professor Emeritus of The Pennsylvania State University.

THE INSECT WORLD OF J. HENRI FABRE. Teale, Edwin Way, ed. 333 pages, indexed. Apollo Editions, New York, N. Y. 1961. $1.95

In the foreword of the 1949 edition Mr. Teale stated that in his editing he had followed the original translation of Alexandra Teixeira de Mattos. Not unlike Fabre in many ways, Mr. Teale has long studied insects and has a warm appreciation of this famous French writer and entomologist, of whom he writes in the biographical introduction.

REGIONAL BOOKS

THE FORGOTTEN PENINSULA; A NATURALIST IN BAJA CALIFORNIA. Krutch, Joseph Wood. 277 pages, illustrated, (colored front.) William Sloane Associates, New York. 1961. $5.00

Another gem from the pen of one of America's finest writer-naturalists, who loves our desert regions—their plants, animals, historic backgrounds, and people. Mr. Krutch has the supreme gift of conveying to his readers vivid glimpses of these lands of wonder.

GARDENING IN BRITAIN. Hadfield, Miles. 483 pages, illustrated, bibliography, indexed. C. T. Branford Co., Newton Centre, Mass. 1960. $12.00

Fascinating history of British gardens from the time of the Roman occupation until World War II, with an amazing wealth of biographical accounts of British plantsmen and landscape gardeners. Contains a comprehensive bibliography.

GARDENS OF ROME. Faure, Gabriel. 201 pages, illustrated. (Beau Pays Series) Distributed by Oxford University Press, New York. 1960. $8.50

In 1923, Monsieur Faure wrote on the gardens of Rome in a quarto limited edition which soon went out-of-print. Since then he has stayed in Rome many times and visited more gardens. This new volume, translated by George Millard, is illustrated with fine photographs and offers the visitor to the Eternal City many glimpses and descriptions of the well-known and less-known gardens.

ILLINOIS WILD FLOWERS. Voss, John and Eifert, Virginia S. 256 pages, illustrated, bibliography, indexed. (Popular Science Series vol. III) Illinois State Museum, Springfield, Ill. 1960. $2.25

Over two-hundred black and white photographs with descriptive text that abounds in interesting facts concerning uses and plant lore. Arranged according to season.

NEW RECORDS FOR ILLINOIS VASCULAR PLANTS. Winterringer, Glen S. and Evers, Robert A. 135 pages, maps, bibliography, indexed. (Scientific Papers Series, vol. XI) Illinois State Museum, Springfield, Ill. 1960. $3.25

Additional information obtained since the publication in 1955 of *Vascular Plants of Illinois* by Jones and Fuller.

THE OUTERMOST HOUSE; A YEAR OF LIFE ON THE GREAT BEACH OF CAPE COD. Beston, Henry. 222 pages. (Explorer Books Edition) Viking Press, New York. 1961. $1.25

A welcome paperback edition of a delightful nature-writing classic.

STATE PARKS OF CALIFORNIA. Robinson, John and Calais, Alfred. 94 pages, illustrated, indexed. (A Sunset Book) Lane Book Co., Menlo Park, Cal. 1961. $1.95

Well-illustrated guide to one hundred and seventy California State Parks and thirty-seven Historic Monuments, giving location of campsites, picnic units, swimming and fishing facilities, elevations, acreage, and facts of current and historical interest.

SUNSET WESTERN GARDEN BOOK; rev. ed. Editorial staffs of Sunset Books and Sunset Magazine. 384 pages, illustrated, indexed. Lane Book Co., Menlo Park, Cal. 1961. spiral binding, $3.95; gift binding, $4.95

Revised and enlarged edition with updated material on insecticides and herbicides. Aims to cover garden climates in seven western states and Hawaii.

BIOGRAPHY AND JOURNALS

AUDUBON AND HIS JOURNALS. Audubon, Maria R. With zoological and other notes by Elliott Coues. 2 vols. 532, 566 pages, illustrated, indexed. Dover Publications, New York. 1960. Each vol. $2.00; set $4.00

A complete, unabridged reprinting of an out-of-print collector's item, originally published in 1897, with critical notes by Elliott Coues and a sympathetic biography by Audubon's granddaughter.

MARK CATESBY; THE COLONIAL AUDUBON. Frick, George Frederick and Stearns, Raymond Phineas. 137 pages, illustrated, indexed, bibliography. University of Illinois Press, Urbana, Ill. 1961. $5.00

The New York Botanical Garden is the proud owner of Catesby's two-volume *Natural History of Carolina, Florida and the Bahama Islands:* Containing the Figures of Birds, Beasts, Fishes, Serpents, Insects and Plants . . . with Descriptions in English and French, published 1741-1743. The authors of this present biography have done a scholarly and very readable work. The text is documented with references to the source material from which they have drawn. Not only concerned with the life of Catesby and his contributions, but with the lives of many naturalists of the early eighteenth century here and abroad whom Catesby knew.

THE HEART OF THOREAU'S JOURNALS; 2nd rev. ed. Shepard, Odell, ed. 228 pages, indexed. Dover Publications, New York. 1961. $1.45

Mr. Shepard's selections of some of the journals written from 1837 to 1861 have been

(Continued on page 152)

REVIEWS OF RECENT BOTANICAL BOOKS

MODERN BIOLOGY. Moon, Truman J., James H. Otto, Albert Towle. 758 pages, illustrated, indexed. Holt, Rinehart & Wilson, Inc., New York. $5.60

The present book is the latest revision of a text that has seen wide use for over thirty years. A successful high school biology text must deal with so many topics in order to satisfy the requirements of various and varied state syllabi, that no topic can be treated exhaustively. Though the authors cannot be expected to stress recent additions to our biological knowledge before these topics are included in subject matter ordinarily taught, the value of the book would have been increased by further information on such topics as DNA, antibodies, etc.

The illustrations are excellent and attractive. Particular reference should be made to the transparencies of the frog and of man. This revision retains the good features of previous editions, i.e., clear and concise definitions, properly organized topics, and material for enrichment of basic concepts. LEON HERVEY

FLORA OF THE SANTA CRUZ MOUNTAINS OF CALIFORNIA. A MANUAL OF THE VASCULAR PLANTS. Thomas, John Hunter. 434 pages, illustrated, indexed. Stanford University Press, Stanford, California. 1961. $8.50

Many years of field work by the author and his predecessors have resulted in this extremely useful manual of the flora of a well-defined area that forms a distinct geographical and phytogeographical unit and that is heavily populated. The Santa Cruz Mountains are part of the Coast Range of California, extending from San Francisco southward to the Pajaro River, somewhat north of the Monterey Peninsula.

W. C. STEERE

GRASSES OF BURMA, CEYLON, INDIA, AND PAKISTAN. Bor, N. L. 767 pages, illustrated, indexed. Pergamon Press Inc., New York. 1960. $25.00

A detailed taxonomic treatment, arranged according to a new general system of the grass family which takes account of recent morphological studies and evolutionary concepts.

ARTHUR CRONQUIST

THE PRE-CAMBRIAN GEOLOGY AND GEOCHRONOLOGY OF MINNESOTA. Goldich, Samuel S., Alfred O. Nier, Halfdan Baadsgaard, John H. Hoffman, and Harold W. Krueger. 193 pages, illustrated, indexed. University of Minnesota Press, Minneapolis, Minn. 1961. $4.00

Age determination of rocks and their relative stratigraphic sequences by radio-activity, particularly in the Pre-Cambrian intrusives and meta-

(Continued on page 152)

MEMBERSHIP

We were delighted to welcome the following new members between January 1, 1961, and March 31, 1961.

NEW MEMBERS

Supporting

Mrs. F. Higginson Cabot
Howard W. Maxwell, Jr.
Mrs. Dudley Wadsworth*

Contributing

Mrs. Robert Fliess*
Mrs. Walter P. Gage
Mrs. Herman M. Kurtz*
Mrs. Ethelbert Ide Low*
Mrs. Hermann G. Place*

Husband and Wife

Dr. & Mrs. Irving Abrahams
Mr. & Mrs. John C. Bruckman
Dr. & Mrs. William C. Clyne
Dr. & Mrs. Ralph M. Crowley
Mr. & Mrs. John Dougherty
Mr. & Mrs. Timothy A. Gerne
Mr. & Mrs. Matthew Kabriski
Mr. & Mrs. Karl Keller
Mr. & Mrs. Charles A. Loreto
Mr. & Mrs. Earl G. Lundstrom
Mr. & Mrs. Aaron S. Naimark
Mr. & Mrs. Charles O'Brien
Mr. & Mrs. Robert G. Shanklin
Mr. & Mrs. Philip Sipser
Mr. & Mrs. George B. Stanton
Mr. & Mrs. Richard G. Unger
Mr. & Mrs. Charles Vogel

Annual

Richard Abbott
Mrs. Thomas M. Alexander
Miss Adele Anderle
Leo J. Armatys
Mrs. Boudinot P. Atterbury
Miss Betty Barford
Mrs. William H. Batchelor
Miss Dorothy S. Bradford
Mrs. G. E. Brewer, Jr.
Charles W. Busk
Mrs. Douglas Calkins
Mrs. Edward C. Chorley
Nicholas P. Cirigliano
Mrs. H. M. Clawson
Mrs. Carleton M. Cornell
Miss Grace K. Eiselstein
Ernest Faris
Mrs. Kenneth G. Futter
Mrs. A. Sumner Gambee
Bernard Glinski
Mrs. Margaret Grace
Mrs. Robert Nathan Graham
Miss Margaret Haegel
Dr. Charles W. Hayden
Miss Beatrice Hawkins
Mrs. Hamilton Hicks, Jr.
Mrs. Ralph Holmes
Ralph Jarcho
William Keith, Jr.
Mrs. Harvey M. Kelsey, Jr.
Marvin S. Kotzen
William W. Krantz
Mrs. Harriet Kushner
Miss Sydney S. Lane
Mrs. Robert C. Laurence, Jr.
Mrs. Bernhard Leirmoe
Mrs. Dunbar Lockwood
Capt. T. Leopold McC. Lonsdale
Mrs. Richard Lowy
Patrick Lundy
Eric W. Lynn
Mrs. A. S. Martin
Richard C. Mugler
Don Muller
Miss Lucy Mueller
Gustav Meyburg
Mrs. Audrey H. O'Connor
Mrs. R. G. Olmstead
Mrs. Walter R. Peabody
Miss Genevieve B. Perri
Mortimer D. Phillips
Miss Susan Scott Phillips
Mrs. Mahlon Pitney
Miss Dorothy Lucille Ransom
Mrs. Ruth Reisch
Mrs. Fortune Roberts
Mrs. S. Harrison Rollinson, Jr.
Mrs. Eve B. Root
Brig. Derek Schreiber
Dr. E. Seale
Mrs. Constance W. Smith
Miss Kathleen M. M. Smith
Mrs. Thomas S. Shinn
Mrs. James Talcott
David E. Thomas
Mrs. Ernest B. Tracy
Mrs. A. D. Turcas Throckmorton
Miss Edith W. Vail
Mrs. Marshall Waterman
Miss Amelia H. Weber
Mrs. Samuel J. Wendt
William Mason Wetzel
Mrs. Gustave E. Wiedenmayer
Mrs. Warner M. Willcox
Miss Trixie Wolf
Allan G. Wood

*Change in Membership Classification

NEWS, NOTES and COMMENTS

At its annual meeting on May 15, 1961, The New York Botanical Garden presented Distinguished Service Awards to Mrs. Ethel Anson S. Peckham, Norman Taylor, and Henry Teuscher. Excerpts of the citations follow:

From her early childhood Ethel Anson S. Peckham was interested in plants, and particularly in garden plants. Her connection with The New York Botanical Garden began in 1915, in which year she exhibited a collection of narcissus in a flower show at the Garden. For a number of years thereafter she served as a member of the Garden Advisory Council.

With her cooperation specimens of iris were secured from many places throughout the United States. The original planting was augmented by further contributions and in 1920 was established as the first test garden of the American Iris Society. Mrs. Peckham actually did much of the planting with her own hands.

Through her interest and that of the Dutch Bulb Growers Association, the Garden received from Holland a gift of thirty-seven thousand bulbs of narcissus to be used as "the foundation of a semi-natural planting of permanent interest." In addition, Mrs. Peckham purchased ten thousand bulbs for naturalizing and for a special display section, from a Narcissus Fund that had been raised under her direction. She not only selected the bulbs and planned their arrangement, but also personally supervised the planting, in October 1924.

In 1925 Mrs. Peckham contributed an interesting and valuable collection of bulbous plants to the Garden. In the following year she supervised the replanting of the test garden of the American Iris Society when "four new beds were made for Dr. John K. Small's collection of native iris to test for hardiness in this climate."

Mrs. Peckham found time to lecture on iris, narcissus, and other plants in the Free Saturday Afternoon Lecture Programs. She wrote articles on iris and daffodils for the *Journal of The New York Botanical Garden* and the *Bulletin of the American Iris Society,* and prepared six articles for *Addisonia* on narcissus. She made a study of dwarf iris, in which over one thousand varieties were alphabetically arranged, and edited the three-hundred-page Alphabetical Check List published in 1929, on which earlier work had been done by John Caspar Wister and Robert Sturtevant.

Mrs. Peckham organized the New Rochelle Garden Club and served several terms as its president. She also functioned as a director for the Ninth District of the Federated Garden Clubs of New York State and a director of the American Iris Society.

To Mrs. Peckham, enthusiastic horticulturist, author, and lecturer, and Honorary Curator of the iris and narcissus collections at the Garden since June 16, 1927, The New York Botanical Garden presents its Distinguished Service Award.

In 1904 Norman Taylor became Museum Aide in The New York Botanical Garden, and during the next seven years filled various positions of increasing responsibility in the Garden. His formal duties were interspersed with numerous travels in the Caribbean. Later he was Curator of the Brooklyn Botanic Garden. During these years he became interested in the native flora of the New York region and published a number of notes on it, and a memoir in 1915. This involved an interest in ecology, the production of several papers on that subject, and editorship for the Ecological Society of America. While his devotion to botany never dwindled, Dr. Taylor now broadened his attack to include horticulture. In 1936 he edited the *Garden Dictionary,* which in subsequent editions became the *Garden Encyclopedia;* the fourth edition appeared in 1961. He was editor of botany, horticulture, and forestry for the Merriam-Webster dictionaries, and produced a series of books on gardening. At the same time he was concerned with the quinine industry, acting as director of the Cinchona Products Institute and as adviser to the Cinchona Institut of Amsterdam, and traveling extensively in Mexico, Brazil, Bolivia, Ecuador, and Peru. A popular book on drugs bears witness to this facet of a many-sided intellectual life.

This varied and productive career was signalized in 1936 by the award of the Gold Medal of the Massachusetts Horticultural Society, and in 1958 by the honorary degree of Doctor of Science conferred by Washington University in Maryland.

The New York Botanical Garden is honored to have in some part shared in Dr. Taylor's many scholarly activities, and in recognition of his many distinguished contributions to botany and horticulture now presents him with its Distinguished Service Award.

Henry Teuscher, a distinguished member of the horticultural fraternity and a citizen of Canada, was born in Germany, where he secured the equivalent of a Master's degree in landscape architecture and horticulture. He acquired further experience, practical knowledge, and skills by acting as an assistant at the botanical garden in Dahlem-Berlin. In 1920 he came to the United States, accepted the position of botanist in charge of the Morton Arboretum in Lisle, Illinois, and served there until 1929 when he was appointed Director of the Boyce Thompson Arboretum in Yonkers. In 1932 he entered the service of The New York Botanical Garden with the title of Dendrologist and in 1935 left that post to accept an appointment as Superintendent and Chief Horticulturist at the then newly established botanical garden in Montreal, in which institution he has served with distinction, his present title being that of Curator.

While Mr. Teuscher is thoroughly familiar with all phases of horticulture, he is probably best known for his knowledge of trees and shrubs. He has written extensively on the subject of hardiness in plants, and in 1956 published a volume entitled *Window Box Gardening*, which was the first complete manual on outdoor window box gardening . . . Another publication is *The Soil and its Fertility*, of which he was the author jointly with R. Adler.

He has written many articles for *The Journal of The New York Botanical* and also descriptions of plants for *Addisonia.*

In 1948 Mr. Teuscher identified the two hundred specimens in the Garden's collection of conifers, a gift of Col. Robert H. Montgomery, and described a new ornamental dwarf form of Colorado spruce.

The reports of the President, Charles B. Harding, of the Director, Dr. William C. Steere, of the Advisory Council and the Volunteer Associates are not included in these pages, since they will be mailed to members of the Garden.

The report on the fund for the library wing, which was presented by Mrs. Hermann G. Place, a Vice President of The New York Botanical Garden, follows:

At last the funds necessary to build our new library wing are in hand. Our target was $500,000 which we raised, and because of the interest and support of Newbold Morris and the Park Department, the City of New York has included the most needed matching funds of $500,000 in this year's capital budget. However, I am going to tell you something that has made all of us very happy. We did actually raise $655,019.81 instead of $500,000. It just seemed to roll in.

The service contract has been sent by the Park Department to the Board of Estimate and we hope, within a few weeks, that the Board of Estimate will approve this contract so that our architects, Eggers and Higgens, may complete the working drawings and that the plans will be out for bids. There is no target date for the ground-breaking, as we have come to realize that all procedures must follow a definite pattern and cannot be accelerated in any way. At least, these methods are conducive to character building best expressed by patience and restraint. However, I do predict that within the next few months we should be able to start.

It is with the feeling of joy and gratitude that I am privileged to announce that the Board of Managers of The New York Botanical Garden has unanimously voted to name the new library wing the Harriet Barnes Pratt Library in recognition of Mrs. Pratt's years of devotion to the Garden and her great gifts, not only of a financial nature, but gifts of the spirit too. Her constant help and love of the Garden have been beacons to light the way.

I want to thank the Board of Managers, the staff of the Garden, and especially Mr. Harding and Dr. Steere without whose help and support our new library wing could never have come to pass. Thank all of you for what you have done to bring this about.

The members, assembled in annual meeting, adopted Mrs. Pratt's suggestion that the reading room in the new library wing be named the Angela Moore Place Reading Room, in appreciation of Mrs. Place's tireless efforts in the raising of the funds.

Re-elected to the Board of Managers (Class of 1964): W. Earle Andrews, Sherman Baldwin, Henry F. du Pont, William E. Hutton, Rev. Laurence J. McGinley, S. J., Mrs. Harold I. Pratt, Mrs. David Rockefeller, Dr. William C. Steere, and Joseph R. Swan.

Elected to the Corporation of The New York Botanical Garden: Mrs. Franklin B. Benkard, Mrs. F. Higginson Cabot, Mrs. Edward W. Freeman, Mrs. Ricardo Gonzales, Mrs. Donald Lowe, Mrs. Harold E. Anthony, and Harold Epstein.

SPRING GARDEN TOUR, 1961

(Based on the notes written by Howard W. Swift, Assistant Curator of Education)

Its illustrious history, its advantageous location, its natural beauty, and its productive soil have made Bucks County, Pennsylvania, one of the famous regions in the United States. Of the well-proportioned mansions and farmhouses, many are over two hundred years old and most frequently built of native stone. Artists, authors, playwrights, and sculptors, drawn by the county's beauty and accessibility, have chosen to live in New Hope and environs. In more recent years industry has moved into the area—the Fairless Works of United States Steel is one of the largest plants.

On the day's tour stops were made at the Washington Crossing Memorial Building, the Washington Crossing Methodist Church, where coffee was served, and at the Thompson-Neely "House of Decision." This has been authentically restored and furnished. The accompanying illustration shows this charming Colonial house in the midst of winter. On the day of the tour the lilacs, some of which are more than one hundred and fifty years old, were bearing their fragrant blooms. A red-cedar *(Juniperus virginiana)* near the path to the root-cellar was noted as being twenty-seven years old when Washington was born. Nearby stands one of the largest hackberry trees *(Celtis occidentalis)* in the area.

Visits were made to several homes and gardens: to Lenteboden, which Charles H. Mueller maintains as a commercial venture; to Gaystone, the home and lovely gardens of Mr. and Mrs. Franklin T. McClintock; to Beaumont House, part of which was erected in 1732 and an addition in 1808 on a William Penn Grants Land. The present owner is Dr. John A. Flood, the Burgess of New Hope. From the native stone house of Mr. and Mrs. Allan Miller, and the expansive lawn around it, there is a panoramic view of the peaceful countryside. Near the entrance to this one-hundred-and-twenty-acre farm are two acres of apple, cherry, and pear trees. On the opposite side of the drive is a garden that has been developed in natural manner, with stream, pools, and outcropping rock. Rhododendrons, azaleas, and laurel furnish background for spring bulbs.

Bowman's Hill State Wildflower Preserve was included on the day's itinerary. Here, on a tract of one hundred acres, set aside by Washington Crossing State Park in 1934, are trees, shrubs, ferns, and flowers native to Pennsylvania. About three hundred species were found to grow naturally on this land, and several hundred more have been introduced. These plants are dedicated as living memorials to the patriots of Washington's Army, who camped on these hills before the battle of Trenton and the crossing of the Delaware on Christmas Night, 1776.

Along the winding entrance to the preserve

Lenteboden—the gardens which Charles H. Mueller maintains as a commercial venture. There are more than one thousand separate plantings of tulips, narcissi, and other bulbs. Many new varieties are imported from Holland and grown on trial in their first American appearance.

The Thompson-Neely "House of Decision" in which General George Washington held conferences to perfect plans for the crossing of the Delaware.

are many fine American beeches *(Fagus grandifolia)* and large patches of May-apple *(Podophyllum peltatum)*. Along the Medicinal Trail yellow ladyslipper *(Cypripedium pubescens)* was blooming, while the pink ladyslipper *(C. acaule)* had not yet opened its buds. The white trillium *(T. grandiflorum)* was blooming freely, and the red trillium *(T. erectum)* was also in flower. The rose-purple flower of the fringed polygala *(P. paucifolia)* caught the attention of visitors. They were also attracted by the kidney-shaped leaves of the twinleaf *(Jeffersonia diphylla)*, by *Hepatica acutifolia* and *americana*, goldenseal *(Hydrastis canadensis)*, the walking-fern *(Camptosorus rhizophyllus)*, and *Sedum ternatum*, the only sedum that grows in moist shady locations.

Wild ginger *(Asarum canadense)*, pipsissewa *(Chimaphila maculata)*, Solomons-seal *(Polygonatum commutatum)*, and the bright fire-pink *(Silene virginica)* drew notice on Harshberger Trail. Over a dozen trails from one hundred to a thousand or more feet long have been laid out through the woods and adjacent fields.

Because of interest in conservation and in the projected Native Plant Garden at The New York Botanical Garden. Bowman's Hill State Wild Flower Preserve had an especial appeal to many on the Spring Garden Tour. This delightful sanctuary should be visited for a longer period than the full schedule on May 10, 1961, allowed in order that one may become acquainted with its wealth of native plant material.

The Native Plant Garden of The New York Botanical Garden

As the bulldozer ruthlessly clears the way for housing projects, shopping centers, and throughways, it not only roots out and destroys the native plants in its path—it also creates environmental conditions in a much wider area that are less favorable and even fatal for wild beings in general. Although the inroads of this "American way of life" are accepted as inevitable by too large a majority of people, those of us who are conservation-minded must be deeply concerned over the ever-increasing rate of disappearance of one of our great natural resources, our native wild plants. Every year that passes brings some handsome wildflower closer to extinction, in direct proportion to the increase in population and the resulting growth of urban areas. Fortunately, this growing emergency has been recognized, and steps have been taken to remedy it by forward-looking and philanthropic citizens and by conservation-oriented organizations, as the Nature Conservancy, the Audubon Society, The Garden Club of America, and many others, through the establishment of natural areas for the permanent protection of native plants and animals.

The New York Botanical Garden has concerned itself with the preservation of the native flora, as well as its elucidation through handbooks and manuals, since the turn of the present century. In 1902, Mrs. Elizabeth G. Britton, wife of the first director of the Garden, was one of the prime movers in organizing the Wild Flower Preservation Society of America (succeeded in 1933 by The Wild Flower Preservation Society, Inc.) and became one of its first trustees. Within a few years, as trustee and later as secretary and treasurer—and because of her vigor and strong conviction—Mrs. Britton had become the motivating force of the organization. By her lectures, published papers, and extensive correspondence, she did much to arouse and develop an enlightened public attitude towards conservation. Still timely and of much interest are her fourteen articles on "Wild Plants Needing Protection," with colored plates from original paintings by Mary Eaton, which appeared in *The Journal of The New York Botanical Garden* between 1912 and 1929.

Thanks to the wisdom and foresight, a half-century ago, of pioneers in the field of conservation of native plants, an undisturbed area within The New York Botanical Garden was set aside for a native plant garden, and later fenced. The almost miraculous existence of this protected area, with a variety of habitats in the midst of a densely populated section of New York City, provides an excellent opportunity for the establishment of a Native Plant Garden.

We stress again The New York Botanical Garden's strong and historic interest in the Native Plant Garden as well as its commitment to it today, even though its development has been delayed for lack of funds. In 1901, the Misses

Above. Hepaticas, *Hepatica acutiloba* and *H. americana*, grow happily in Bowman's Hill State Wild Flower Preserve.
Left. The royal-fern, *Osmunda regalis*, uncurls in early spring. These are the kinds of plants that will be seen in the Native Plant Garden of The New York Botanical Garden.

Olivia and Caroline Phelps Stokes of New York presented to The New York Botanical Garden a fund of $3,000, on condition that the interest thereon "should always be used for the investigation and preservation of native plants or for bringing the need of such preservation of native plants before the public." In spite of the prophetic vision and worthy cause of the donors of the Stokes Fund, the income from this fund does not go very far, especially today. The Committee needs much more money—the income from $250,000—to establish and maintain a Native Plant Garden of the outstanding quality both necessary and possible.

Under the leadership of Mrs. John Donaldson, Mrs. Percy Douglas, and other responsible citizens, a Committee on the Native Plant Garden has been formed. It includes members of national garden clubs, conservation groups, scouts, Audubon Society, horticultural and botanical societies (including the American Fern Society and The Wild Flower Preservation Society, Inc.) authors, photographers, lecturers, teachers, and others.

The Committee plans to raise an endowment fund of $250,000, the income from which will guarantee support and maintenance of the Native Plant Garden in perpetuity, and will permit effective programs of teaching and research on native plants, as well as the publication of leaflets and pamphlets to enhance and to reinforce the public interest in conservation of native plants. Through research on propagation of native plants, and on their ecological requirements, tolerance, hardiness, and other important questions, we may yet save some of them from permanent extinction. Moreover, with such information available, nurseries may be encouraged to propagate wild flowers instead of collecting them in their natural habitats, usually illegally.

The Committee plans to donate most of the plants needed, which will be obtained from areas to be bulldozed, cleared, or otherwise made inhospitable to desirable native plants, as well as from their own properties, using accepted conservation practices in so doing. With few exceptions, the native plants will be those indigenous to the northeastern United States, both rare and common. Emphasis will be placed on wild flowers, herbs of interest, and ferns. Space will not permit the introduction of large woody plants, even those with handsome flowers. However, most if not all of them already flourish elsewhere on the grounds of The New York Botanical Garden.

The protected land to be devoted to the Native Plant Garden lies within a fenced area adjacent to the Thompson Memorial Rock Garden, within the grounds of The New York Botanical Garden. Its approximately three acres present a surprising range of habitats, including various types of woodland, rocks, marshy areas, a stream, and a sunny meadow. The plan prepared by Jack Crawford for the Committee covers primarily the wooded area, in which a water system and paths have already been installed, as well as several thousand plants. The Committee plans to develop the meadow area next and eventually to add a limestone section. Coldframes and a propagating house are essentials. A naturalistic shelter is planned; this will serve as an information center, house pamphlets and other educational material, and provide a place to demonstrate present and future plans of the Garden and to show pictures, changed each week, of important plants, flowers, seeds, and birds to be seen at the time.

A native-plant gardener who will put nearly full time into guiding and informing the public half the year, as well as guarding the rarer plants, and will engage in research, teaching, lecturing, and writing the other half, is an essential part of the Committee's plan. At first, planting and adequate labeling will be heavy and time-consuming responsibilities, whereas the research and educational functions will be stressed later. With its manifest dedication to botany and horticulture, The New York Botanical Garden can provide outstanding facilities to the Native Plant Garden, in addition to the land itself. The magnificent Library is an excellent resource, and the staff can furnish help and advice on most botanical and horticultural topics.

In her recent book, *This is the American Earth*, Nancy Newhall gives a thoughtful and moving definition of conservation as "humanity fighting for the future." Please join this fight and help us bring back to New York City native plants that have disappeared completely from this great urban area, and others that are on the verge of extinction, as well as the commoner native plants that everyone should know. The Committee hopes that you will contribute generously to make this Native Plant Garden a reality, and a positive force as well as a living example of conservation in New York City.

The Batsto Nature Area in southern New Jersey's Wharton Tract was opened to the public on May 27, 1961. The planning of the preserve was done largely by James A. Sharkey and William Mullen, botanist and archaeologist, of the Wharton Tract. The project is directed by the New Jersey Department of Conservation and Economic Development.

The New Jersey Federation of Women's Clubs raised the funds for the Batsto Nature Trail, which runs through part of New Jersey's famous pine barrens. Along the trail are more than one hundred different kinds of native plants. Mr. Sharkey will conduct groups of adults through the Batsto Nature Area, and William Chaney, a botanist, has been engaged to guide groups of children through the area this spring and summer. Tours should be booked through the Wharton Tract Office, Greenbrook R. D. 2, Egg Harbor City, New Jersey.

Activities of the Director and Staff. Within the past few months, Dr. William C. Steere, Director, visited the Medical School of Tufts University, also Brandeis University, which has many impressive new buildings; visited Sydney Gould in his newly furnished quarters at the Connecticut Agricultural Experiment Station, where he will carry on his work on the preparation of an international plant index, using punch cards and data processing machines, through a NSF grant to the Garden; visited the University of Colorado, Boulder, as consultant on the expansion program of the Department of Biology; attended a meeting in Washington, D. C., of the Governing Board of the American Institute of Biological Sciences; a meeting in Buffalo, New York, of the Council of the New York State Association of Museums; a meeting of the Board of Trustees of the Bayard Cutting Arboretum at Oakdale, Long Island; a meeting of the New York Center for Biomathematical Research at the Sloan Kettering Institute, New York City; a meeting of the Advisory Council of the Department of Biology of Princeton University at Princeton, New Jersey; a meeting in Blue Mountain Lake, New York, of the Committee on Museum Resources; a meeting in Washington, D. C., of the Advisory Council of the Biological Sciences Communication Project, AIBS; and a luncheon of the Park Association of the City of New York at the Riverdale Yacht Club, New York City.

Dr. Bassett Maguire, Head Curator and Coordinator of Tropical Botany, lectured on "Some Flowering Plants of the South American Tropics" at the fifteenth annual Garden Symposium at Colonial Williamsburg. Dr. Maguire gave this lecture at the May meeting of Torrey Botanical Club, which was held at the Garden.

Dr. Harold William Rickett, Bibliographer and Senior Curator of the Library, was shown the facilities of the Brooklyn Public Library after he and Dr. Steere had lunched and consulted with Dr. Francis St. John, the Director of the Brooklyn Public Library, on the plans for the new wing to the Garden's Library. Dr. Rickett spent several days at the Gray and Arnold Arboretum Herbariums of Harvard University.

Dr. Arthur Cronquist, Curator, gave a seminar at the University of Minnesota. He collected in a sequestered area of the Atomic Energy Commission around Las Vegas, Nevada, with Dr. Janice Beatty, ecologist of the Atomic Energy Commission. Dr. Cronquist has also been collecting in Utah and will remain in that area until the middle of July. He will participate in the Science Institute for high school biology teachers to be held at Washington State University, at Pullman, and will give several seminars in the West.

Dr. Richard M. Klein, Alfred H. Caspary Curator, attended a meeting of the New England Section of the American Society for Plant Physiologists in Durham, New Hampshire, and the annual meeting of the Society for Economic Botany held in the Faculty Club of the Massachusetts Institute of Technology.

Rachel di Noia, who has assisted Dr. Steere during her summer vacations, will begin work for her Master's degree at Fordham University in cooperation with The New York Botanical Garden under Dr. Klein. Biruta Eimanis who assisted Dr. P. P. Pirone, Senior Plant Pathologist, in his laboratory for a year and a half, is working for her Ph.D. at Pennsylvania State University.

Dr. David J. Rogers, Curator of Economic Botany, attended a meeting at the National Institutes of Health, Bethesda, Maryland, at which botanists, biochemists, and pharmacologists considered ways and means by which these three

A bee gathers nectar from the New England Aster, Aster *novae-angliae*, in Bowman's Hill State Wild Flower Preserve.

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Members of the Garden are entitled to a substantial discount on most registration fees. Why not attend classes at The New York Botanical Garden this fall and make greater use of your membership?

THE NEW YORK BOTANICAL GARDEN

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groups can cooperate in expanding investigations on drug plants of the world and in collecting information on the fast diminishing native users of natural drugs. Dr. Rogers also attended the annual meeting of the Society for Economic Botany; the topic of the symposium was "Nutrition, Feeding a Hungry World."

Dr. Marjorie Anchel, Senior Research Associate, accompanied by Dr. Nalini N. Valanju and Dr. Trevor C. McMorris, Research Associates, attended the meetings of the Federation Proceedings at Atlantic City, New Jersey.

T. H. Everett, Assistant Director (Horticulture) and Elizabeth Hall, Sarah Gildersleeve Fife Research Librarian, accompanied the Advisory Council when it visited the Edward C. Delafield estate at Riverdale, New York. The Council lunched at the Snuff Mill before visiting Mr. Delafield's estate.

Dr. Clark T. Rogerson, Curator of Cryptogamic Botany, has been concentrating his efforts and energy in getting *Mycologia* back on schedule. It has been a tremendous task, in which Dr. Rogerson has been aided by Mary Fleming, Technical Assistant. The November-December 1959 issue and the January-February 1960 issues have been mailed; the March-April and May-June 1960 issues are at the printers, and the July-August issue is being made ready for the printers.

Mrs. Fleming has been appointed chairman of the rhododendron display of the American Rhododendron Society, New York and New Jersey Chapters, at the International Flower Show in March 1962.

Dr. Caroline Allen, Research Associate, discussed "Taxonomy" at a Senior Seminar of the Department of Plant Science of Vassar College, Poughkeepsie, New York. Dr. Allen gave an illustrated lecture, in the In-Service Course for Teachers at the Garden, on "The Arnold Arboretum and Its Gift to Gardeners." She was associated with the Arboretum for a number of years. Dr. Allen reecntly visited the Gray and Arnold Herbariums of Harvard University.

Dr. Herman Becker, Research Associate, is collecting fossils in Oregon, Utah, and Montana. He will return to the Garden in late August or early September. Peter Roff, a botany student at Hunter College and a member of the Torrey Botanical Club, is assisting Dr. Becker in the field this summer.

Dr. Herbert N. Gleason, Curator Emeritus, spent several days at the Garden this spring. He completed the second revision of *Plants of the Vicinity of New York* to be published by The New York Botanical Garden.

Dorothy Ebel Hansell, Editor of *The Garden Journal,* viewed the exhibition, "Festival of Flowers," at the Montclair (New Jersey) Museum of Art in which member clubs of The Garden Club of America and of the Garden Club of New Jersey cooperated. Among the many exhibits were merry garden prints by Martin Engelbrecht, loaned by Mrs. Roy Arthur Hunt of Pittsburgh, Pennsylvania. Mrs. Hansell attended World Gardening Day, sponsored by the Garden Club of New Jersey at Montclair, New Jersey, at which Mrs. Z. Marzouk, Director General of Social Concerns and Labor of Alexandria, Egypt, and a member of the Assembly of the U.A.R., gave an illustrated talk on gardening in her country; and was a guest at the garden party and luncheon that was tendered the National Association of Gardeners by Mrs. Ricardo Gonzales at her estate, "Brookside," Rye, New York. Mrs. Hansell is an honorary life member of the Association.

George Friedhof retired on Arpil 29, 1961, having been in the employ of The New York Botanical Garden since April 1903. Now at the age of seventy-five George (he has never been called anything else) can look back on an almost perfect attendance record. No one can recall that he was ever tardy or absent. A brief ceremony was held at the Propagating Range where George had tenderly cared for seedlings for fifty-eight years. Dr. Steere presented him with a purse, on behalf of the garden, in appreciation of his many years of faithful service.

Reception for Graduates. Dr. Julian A. Steyermark, Botanist at the Instituto Botánico, Ministerio de Agricultura, Caracas, Venezuela, was guest speaker at the reception for graduates in the Two-year Course in Botany and the Two-year Course in Practical Gardening. His topic was "A Botanist's Impressions of Gardens in the American Tropics."

The reception was held in the Ramskeller Room in the Campus Center Building at Fordham University on the evening of June 20, 1961. T. H. Everett, Assistant Director (Horticulture) and Curator of Education, addressed the graduates and their relatives and friends.

Frederick S. Moseley, Jr., Vice President of The New York Botanical Garden, presented certificates to: Concetta Di Pietro, Richard T. Downes, Bess Hamers, George B. Stanton, and Elizabeth Wunder who had satisfactorily completed the Two-year Course in Botany; and to Charles Baiano, Curt Hagen, Jr., Greta Karppi, Rosalie Leslie Loreto, Dominic Michael Mascio, Robert H. K. Murray, Jennie Musci, Zelda Schwartzberg, Biondino R. Serpone, George B. Stanton, Dorothy O. Steere, and Samuel Weinstock on the satisfactory completion of the Two-year Course in Practical Gardening.

Staff Seminars. Dr. William C. Steere, Director, discussed "Botanical Activities in Argentina" at the March seminar; Dr. Howard S. Irwin and Dr. Stephen S. Tillett, Research Associates, "Field Activities in South America, 1960" at the April seminar; Dr. David J. Rogers, Curator of Economic Botany, "Systematics of *Manihot esculenta* and Allied Species" at the May seminar; Dr. Julian A. Steyermark of Caracas, Venezuela, on "The Botanical Institute and the Botanical Garden and Parks in Caracas" at the June seminar.

Gift to the Library. A folio of specimens collected in 1805 by John Torrey on a western trip with Thomas Faile, was presented to the Library by Mrs. Lynette Scribner. It had been in the possession of Miss Edith Faile, Faile's granddaughter.

Visitors to the Garden. Within recent months the following have visited the Garden:

Dr. H. Radcliffe Roberts, Director, The Academy of Natural Sciences, Philadelphia, Pa.

Dr. Ruth Patrick, Chairman, Department of Limnology, The Academy of Natural Sciences, Philadelphia, Pa.

Prof. André Aubréville, Museum National d'Histoire Naturelle, Paris.
Henry F. du Pont, Winterthur, Del.
Joseph Swan, Farmington, Conn.
Dr. Jerry Walker, Plant Pathologist, Brooklyn Botanic Garden, Brooklyn, N. Y.
Drs. Marion Wilson, Oswald R. James, Clark F. Begg, St. Luke's Hospital, New York, N. Y.
Dr. Aoishima, Government Forestry Experiment Station, Tokyo, Japan.
Dr. S. F. Kudzin, Clemson, S. C.
Carl Schiff, Horticulturist, Department of Parks, City of New York.
Dr. José Jiménez, Santiago, Dominican Republic.

The American Iris Society, at the special exercises held at The New York Botanical Garden on May 26, 1961, to commemorate the founding of the Society at the Garden, presented citations to Dr. Henry A. Gleason, Head Curator Emeritus, Mrs. Ethel Anson S. Peckham, Honorary Curator of the Iris and the Narcissus Collections since June 1927, and Dr. John C. Wister. The presentation was made by Robert Carney, of Memphis, Tennessee, Vice President of the American Iris Society. The citation to Dr. Gleason follows:

Henry A. Gleason, as Assistant Director of The New York Botanical Garden encouraged John C. Wister in his efforts to create a society devoted to iris, giving him the names of individuals who would be helpful in the movement, organizing the events at the Garden—the morning meeting, the luncheon, and the afternoon session on January 29, 1920—and enlisting the interest of the Director, Dr. Nathaniel Lord Britton, in setting aside a plot of ground at The New York Botanical Garden for irises and in providing for the development and maintenance of the extensive iris collection which became the first trial garden of the American Iris Society in 1920.

To Dr. Gleason, famed botanist, author, teacher, the American Iris Society, on this forty-first anniversary of its founding at The New York Botanical Garden, presents this citation in grateful appreciation of his interest and cooperation.

T. H. Everett, Assistant Director (Horticulture) presided at the ceremonies. Dr. William C. Steere, Director, welcomed the members to the Garden. Dorothy Ebel Hansell, Editor of *The Garden Journal*, a Vice Chairman of the Convention Committee of the American Iris Society, was responsible for the editing and the printing of the convention program booklet.

Henry Teuscher, retiring Curator of the Montreal Botanic Garden, is developing a new botanical garden in Birmingham, Alabama, which he has designed. He has given lectures in that city on window boxes, and residents have become enthusiastic about them and want to decorate their city with beautiful window boxes. This is a result of Mr. Teuscher's book on *Window Box Gardening*, which was developed from his work in Montreal in which a large segment of that city took part.

The Arnold Arboretum is getting a much-needed greenhouse range, considerably larger than the one erected in 1928. It will have innovations to facilitate plant propagation and horticultural research. Included in the main building will be a research laboratory, a conference room, and three fifty-foot greenhouses of aluminum construction with automatically controlled environmental areas. Walk-in cold-storage rooms, to augment investigations in seed storage and research in plant hardiness, will offer temperature ranges to —20°F. An added feature is a large pithouse for the winter storage of woody plants; this will be automatically controlled by heating and cooling units so that a uniform temperature near the freezing point can be maintained from October to May. A saran-cloth shadehouse for evergreens, plant frames, and a nursery will surround the buildings and provide one hundred per cent more plant growing space. The collection of a hundred different kinds of hedges will be relocated near this greenhouse area. A collection of dwarf conifers will be located around an hexagonal redwood display house in which the valuable Larz Anderson collection of century-old Bonsai plants will be featured.

The greenhouse range was designed by Griswold, Boyden, Wylde, & Ames, Architects. Ground-breaking ceremoniees on May 12, 1961, were held at the site where the new greenhouse range will be erected. Among those present were President Nathan N. Pusey of Harvard University; Dr. George Taylor, Director of the Royal Botanic Gardens at Kew, England; Dr. Philip A. Munz, Director Emeritus of the Rancho Santa Ana Botanic Garden, Claremont, California; Dr. John M. Fogg, Jr., Director of the Morris Arboretum of the University of Pennsylvania; Oliver Wolcott, President of the Massachussets Horticultural Society; Henry F. du Pont of Winterthur, Delaware, a member of the Board of Managers of The New York Botanical Garden; Dr. Richard A. Howard, Director, Dr. Donald Wyman, Horticulturist, and others of the Arboretum's staff.

All-America Rose Selections announce that four roses have won the 1962 AARS award: 'Christian Dior', a Hybrid Tea, bears large crimson-red flowers. 'King's Ransom' is the first yellow Hybrid Tea to win AARS honors since 1950. 'Golden Slippers' is a color break in the Floribunda class. Its bright gold buds are flushed with red; the upper petal surface of its good-sized flowers are orange-vermilion, the lower surface a rich gold. 'John S. Armstrong' bears its velvety, deep red flowers (up to four inches across when fully opened) in clusters, but on long individual stems ideal for cutting.

Visitors to the Rose Garden of The New York Botanical Garden on Rose Day, June 13, 1961 saw forty All-American Award Winners among the many varieties that grace the beds and borders. Guides through the Rose Garden were led by Dr. A. D. Mollin, Peter Kooy, Dr. Cynthia Westcott, and Edward O'Keefe.

Dr. A. D. Mollin's hobby of twenty years has been growing roses at his home and dental offices in Great Neck, Long Island. He has won more than one hundred awards, including medals. He is a member of the American Rose Society, has written for the *American Rose Magazine*, and taught a class on "Roses and How to Grow Them" this spring at the Garden. Peter Kooy joined Bobbins & Atkins in Rutherford, New Jersey, in April, 1911, coming from Hillegoom, Holland, and remained with them until

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Top row. Southern slope of Altiplanicie de Nuria. The abrupt point at the left, known as El Picacho, was climbed by the expedition. A cloud-forest covers the summit at an elevation of two-thousand feet.

Second row, left. Altiplanicie de Nuria. View from rocky point of El Picacho on the vast extent of lowland forest and savanna.

Second row, right. In mid-background, El Picacho can be seen. View in savanna on the summit of Altiplanicie de Nuria.

Third row, left. The summit of Altiplanicie de Nuria at an elevation of fifteen hundred feet. Showing savanna and moriche palm areas in western section and upraised edges of escarpment rising to two thousand feet along the Altiplanicie.

his retirement in 1958 after a lifetime with roses. He was superintendent of the rose department, supervising budding, storing, and filling rose orders, and still had time to give friendly advice to customers who visited the nursery. Dr. Cynthia Westcott, nationally known as "The Plant Doctor" is an ardent rosarian, lecturer, writer for magazines and newspapers, and author of a number of books. Edward J. O'Keefe is superintendent of the Mrs. M. Neuberg estate of White Plains, New York. He is well known as a flower show judge, is an instructor in the Educational Program of The New York Botanical Garden, and is especially interested in single roses.

Guiana Exploration. Another phase of The New York Botanical Garden's ten-year Guiana Program of exploration was recently brought to conclusion through the efforts of Dr. Julian A. Steyermark of the Instituto Botánico, Caracas, Venezuela. He conducted for the Garden, in collaboration with the Instituto Botánico of the Ministerio de Agricultura y Cria, a series of expeditions which lasted from mid-October, 1959, until February 18, 1961, into the Sierra Imataca, Altiplanicie de Nuria, and areas in the Delta Amacuro Territory south of the Orinoco River. This is a region of heavily forested country which extends east into British Guiana. The Altiplanicie de Nuria is an elevated, mainly densely forested terrain, whose escarpments, attaining an altitude of two thousand feet, are capped by cloud forests. Between these escarpments, the Altiplanicie has the form of a depressed basin, covered by savanna and moriche palm areas in the western part, but eventually being covered by continuous forest eastward. The Altiplanicie divides the streams flowing northward into the Orinoco and those flowing southward into the Cuyuni drainage. Many trees and other elements of the flora encountered in this area were found to be species known previously from the Guianas, or from northern Brazil, but not previously recorded from Venezuela.

In order to cover this extensive region, the

expedition penetrated into four different areas, establishing new camps in each section. First, by foot and by dug-out canoe, the Río Amacuro, which borders British Guiana and Venezuela, was botanized somewhat above the region of San Victor. Then, the Cuyubini and Acure rivers, which also flowed northward into the Orinoco River, were botanized during the remainder of a month's exploration into this Delta Amacuro Territory. A three-week overland journey, with the equipment moved by burros and Indian carriers, was made into the Río Toro section as far as the Río la Reforma. This is a rugged section of the Imataca Mountains. The final month and a half was concentrated on the western and southern portions of the Altiplanicie de Nuria.

The Orinoco Mining Company, through the courtesy of Fred Wright, facilitated the travel down the Orinoco River by means of a launch. This greatly aided the expedition's reaching the mouth of the Río Amacuro.

Altogether, approximately fourteen thousand herbarium specimens, consisting of twenty-two hundred and fifty numbered collections, were obtained in this period of exploration. Dr. Steyermark arrived at the Garden the latter part of April and will spend four months in research on Guayana members of the *Rubiaceae* collected by expeditions of the Garden. He will then return to the Instituto Botánico at Caracas.

"Focus on Home Gardening 1961." Several hundred home gardeners gathered in Town Hall, New York City, on May 11, 1961, to discuss garden problems and techniques with a panel of experts. On the panel were Mrs. Ruth Alampi, TV and radio personality; Dr. George S. Avery, Director of the Brooklyn Botanic Garden; Ralph Bailey, Garden Editor of *House and Garden;* Mrs. Helen S. Hull, Past President of the National Council of State Garden Clubs, lecturer, and author; James S. Jack, Superintendant of "Brookside," Rye, New York; Dr. Ordway Starnes, Associate Director of the New Jersey Agricultural Experiment Station; Edwin F. Steffek, Horticultural Editor of *Popular Gardening*, and Dr. H. L. Haynes, Technical Manager of Biological Products, Union Carbide Corporation. Similar seminars will be held under the sponsorship of Union Carbide Corporation in major cities of the United States.

Syracuse Forestry College dedicated its forty-six-year-old wood collection as the Harry Philip Brown Memorial Wood Collection, in honor of the former faculty member who was the founder and curator of the collection for thirty-five years. It ranks among the few extensive validated wood collections in the world and includes almost twenty thousand specimens. North and South America are most completely represented. The dedication took place during the three-day celebration of the golden anniversary of the State University College of Forestry at Syracuse University.

Dr. Hardy L. Shirley, Dean of the College of Forestry, announced during the celebration that a 1,000-curie, Cobalt-60 source for use in radiation research had recently been installed at the college. It will be used as a source of energy in chemical reactions and will be part of the research facilities of the Forest Chemistry Department under Dr. Conrad Schuerch, Chairman. It was obtained through a grant from the Atomic Energy Commission, under which Dr. Vivian Thomas Stannett, Dr. John A. Meyer, and Dr. Michael M. Szwarc will direct research on ionic polymerization.

A number of leaders in forestry and conservation participated in the observance of the fiftieth anniversary of the College of Forestry: Prof. Eino Saari of the University of Helsinki, Finland, and Honorary President of the Fifth World Forestry Congress; Richard E. McArdle, Chief of the United States Forest Service; Conrad L. Wirth, Director of National Park Service; Laurence Rockefeller, Chairman of the Outdoor Recreation Review Committee; Dr. Harold G. Wilm, New York State Conservation Commissioner; Dr. Irving W. Bailey, Professor Emeritus of Botany of Harvard University; Dr. Ellwood S. Harrar, Jr.; Dean of the School of Forestry of Duke University; Orville W. Spicer, President of The Bartlett Tree Expert Co., and others.

Mohonk Garden Holiday, September 5-9, 1961, at Lake Mohonk Mountain House, in Ulster County, New York, offers nature walks, workshop in flower composition, lecture-demonstrations in flower arranging, lectures on garden maintenance, plant material, and procedures in horticultural exhibition. The lecturers are Mr. and Mrs. Henry Downer, Alice Dustan Kollar, and Marjorie V. Barton. Full details may be had from Ruth H. Smiley, Program Chairman, Mohonk Lake, New York.

The American Boxwood Society is being organized, and interested parties may address Dr. Walter S. Flory, Curator of the Orland E. White Research Arboretum, Boyce, Virginia. The Research Arboretum is a unit of the University of Virginia's seven-hundred-acre Blandy Experimental Farm. A number of amateur gardeners, eminent horticulturists, nurserymen, and others decided such a society would be desirable for the exchange of information on the species and varieties of *Buxus*, on their propagation and uses in planting, and on control of the few pests that attack boxwood.

Laboratory-Administration Building for the United States National Arboretum. Funds for the building were provided by Congress last fall; construction is expected to start this year. According to Dr. Henry T. Skinner, Director, the two-story building of contemporary design will provide offices and laboratories for the research staff, a library, space for plant processing and recording, and study rooms for visiting researchers. There will also be a herbarium with capacity for more than a million specimens. The auditorium wing will be surrounded by a reflecting pool, which will provide a habitat for aquatics and also serve the building's air-conditioning system.

Also scheduled for construction at the National Arboretum are permanent residences for a guard and for the superintendent of greenhouses, remodeling of two vehicle entrances, a pedestrian gate, and additional parking space for one hundred and fifty cars. The total cost is expected to be a million and a half dollars; construction will be completed about mid-1962. Five greenhouses are being constructed.

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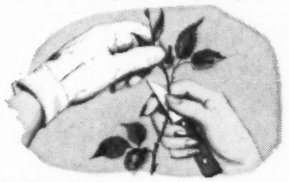

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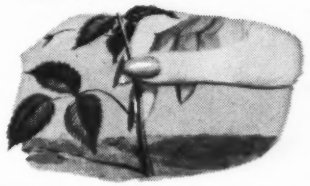

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ing, which includes a collection of boxwood —will furnish bloom interest in mid-May from the peonies, in July from the hemerocallis, and all-season interest from the boxwood. The peonies were donated by the American Peony Society, the hemerocallis by the Hemerocallis Society of America, and the boxwood by plant breeders and nurserymen.

The Sixteenth International Horticultural Congress will be held in Brussels, Belgium, August 31-September 8, 1962. It is interesting to note that the First International Horticultural Congress was held in Brussels in April, 1864; with a mere twenty months ahead of the actual date, it will be possible to celebrate the centenary of the International Horticultural Congresses in the very town where they originated.

The First Congress, organized in connection with the Universal Horticultural Exhibition, was a remarkable success. A large number of experts from all the European countries, came to the conclusion that horticulture could be considered "not only as an art (perhaps even a science), but also as a trade and an industry." The general secretary of the First Congress, which was organized by the Féderátion des Sociétés d'Horticulture de Belgique, was Edouard Morren, Professor of Botany at the University of Liège and well-known editor of *La Belgique Horticole*, a remarkable nineteenth-century journal on gardens, glasshouses, and orchards. The 1864 Congress brought together a large number of horticultural experts and botanists; among them was Dr. Von Siebold, the famous explorer of Japan.

Several other International Congresses were organized: Ghent, 1883; Paris, 1885 and 1889; and Chicago 1893. However, it was only in the early twentieth century that a committee was set up to organize International Horticultural Congresses at regular intervals. The more recent congresses organized by this committee were held in London (1952), Scheveningen (1955), and Nice (1958).

The International Committee for Horticultural Congresses meeting in Nice on April 15, 1958, decided to entrust Belgium with the organization of the Sixteenth International Horticultural Congress in 1962, thus increasing the interval between Congresses from three to four years. The Brussels Congress is being organized under the auspices of the International Society for Horticultural Science, which was founded in April, 1959, and has taken over the activities of the International Committee for Horticultural Congresses.

The Congress Secretariat is located at the State Agricultural College, Coupure links, 235, Ghent, from which further information can be obtained.

International Horticultural Exhibition will be held in Hamburg, Germany, from the end of April to the middle of October, 1963. In October, 1953, when the International Exhibition closed, about five million visitors had seen the horticultural achievements of eighteen nations. Eighteen nations have consented to participate in the 1963 exhibitions, and negotiations with another thirty-five nations are under way. The exhibition area will be double that of the 1953 exhibition, and an attendance of ten million is anticipated. Information may be obtained from K. Passarge, Chairman of the Administration of the International Horticultural Exposition, I.G.A., Planten un Blomen, Hamburg, 36, Germany.

BOTANICAL BOOKS (from page 142)

morphics of the Canadian Shield, have now become refined through the more sensitive and more accurate methods of potassium-argon and rubidium-strontium dating. Results of radioactive dating in northern, east-central, and southwestern Minnesota permit a more conclusive correlation of the basement complex within the state, and also with adjacent Pre-Cambrian features in Ontario, Wisconsin, and Michigan. Since contiguous sedimentaries are rare here and fossils practically absent, these sensitive methods tend to authenticate the earliest geological history of the American continent to a much greater degree than was hitherto possible.

The project, although a geological one, employs highly sophisticated chemical, isotopal, and mathematical analyses based on findings of the past five years. Its results represent a pioneering guide line for future work in other regions of the world. It is to be expected that such areas with a comparable lithology will also be subjected to an age revision by methods now applied to the pre-cambrian of Minnesota.

HERMAN F. BECKER

STUDIES IN PALEOBOTANY. Andrews Jr., Henry N. 487 pages, illustrated, indexed. John Wiley & Sons Inc., New York. 1961. Cloth $11.75

This profusely illustrated study and introduction to paleobotany merits a milestone regarding recent paleobotanical texts. Its eighteen chapters retain something of the conventional sequence but are completely brought up-to-date according to the most recent findings and changes. An introductory chapter on basic principles incorporates the refined potassium-rubidium method for rock dating and the use of modern acceptable hypotheses as they apply to this field. Harold C. Bold's plant classification forms the taxonomic basis for evolutionary sequence. Plant anatomy and wood anatomy, so essential to paleobotanical determinations, are stressed. Zimmerman's telome concept is critically evaluated and the evolutionary thread is followed throughout the book. The reader is gradually but firmly eased into an understanding of a difficult and often controversial subject. Of particular value are expansive chapters on Tertiary floras and fossil plants of the Arctic and Antarctic. Their taxonomic and ecological relationship to modern floras is presented with a characterization, occurrence, and relationship of these floras to each other, and appropriate regional and epochal climate interpretations. The last two chapters present palynology and techniques for studying fossil plants, a long overdue and most useful addition to a modern text.

A glance at the extensive references following each chapter shows that the author drew heavily and profitably on the foremost authorities in this field. Numerous papers are cited from Scandinavia, England, Belgium, France, and even from Hungary and the U.S.S.R. The majority of these references are very recent suggesting the rise of a most active and progressive generation of paleobotanists, especially in the United States.

The book is attractively designed with large and clear print and is adorned with numerous pertinent charts, drawings, and photographs. Its only drawback appears to be the price.

HERMAN F. BECKER

RECENT BOOKS (from page 142)

grouped so as to correspond with the main events of Thoreau's life. This edition includes a new preface, notes, and introduction.

GARDEN PLANTS AND LAWNS

FLOWERING CACTI AND OTHER SUCCULENT PLANTS. Rose, H. 100 pages, illustrated. Sterling Publishing Co., New York. 1960. $2.50

Brief descriptive and cultural notes with forty full-color photographs should interest the budding cactus and succulent plant enthusiast.

The architect's model of the administration-laboratory building for the United States National Arboretum, Washington, D. C.

GARDEN SHRUBS AND TREES. Harrison, S. G. Key to Genera by R. D. Meikle. 318 pages, illustrated (part colored), indexed, bibliography. (The Kew Series) St. Martin's Press, New York. 1960. $4.95

A fine little work of excellent color plates and line drawings and authoritative text in non-technical language. The Kew Series are written by members of the botanical staff of the Royal Botanic Gardens, Kew.

THE GOLDEN GUIDE TO LAWNS, TREES AND SHRUBS. Strohm, John, ed. 176 pages, illustrated (part colored), indexed. Golden Press, New York. 1961. $1.00

Inexpensive paper back with good regional sections. The contributors, well known in horticultural circles, are John Strohm, Milton Carleton, Arnold M. Davis, John Hill, William Weers, Charles J. Hudson, Richard D. Westcott, and Dean Collins.

THE LAWN BOOK. Schery, Robert W. 207 pages, illustrated, indexed. The Macmillan Co., New York. 1961. $5.95

Dr. Schery, who is Director of The Lawn Institute at Marysville, Ohio, presents the very latest findings on lawn preparation and care. Especially good are the illustrations of weeds. Recommendations are given for various climatic conditions throughout the United States.

MINIATURE ROSES. Genders, Roy. 104 pages, illustrated (part colored), indexed. St. Martin's Press, New York. 1961. $3.95

From England comes this first book devoted entirely to miniature roses, with sections on their history, propagation, descriptions, and culture.

ROSES; GROWING FOR EXHIBITING. Allen, Harold H. 175 pages, illustrated, indexed. D. Van Nostrand Co., Princeton, N. J. 1961. $4.95

The author has won numerous blue ribbons, sweepstake trophies, and national awards. The first half of the book deals with rose growing, and the rest is devoted to flower show exhibiting and judging.

IDEAS FOR ENTRYWAYS AND FRONT GARDENS. Sunset Books, Lane Book Company, Menlo Park, California. 1961. $1.50

Sunset Publications has answered parking and planting questions in a fresh, interesting manner in their new book *Ideas for Entryways and Front Gardens*. For a nation on wheels, their numerous illustrations and short concise descriptions turn a parking problem into an attractive way welcoming guests into a garden picture setting.

In some instances, screens and planting give privacy and subtilely lead to the entrance. In other instances, the street side of the property is boldly turned into an open shaded parking area of patterned pavement with a foliage background.

Some of the pictures would be more useful if accompanied by simple layout plans to show the scale, proportion, and relationship of the paved and planted areas.

In the section on steps there are a few illustrations of formal treads and risers with adjacent slopes of rock piles that do not harmonize. Perhaps vines will erase this unrelated mixture in time.

The few illustrations of cute, busy, and cut-up areas are fortunately in the minority. If readers in the northern part of this country remember that the use of wood is better suited to a dry climate than to their own more moist conditions, they will find this book filled with useful ideas.

ARTHUR F. MURPHY, L. A.

THE CAMELLIA. Urquhart, Beryl Leslie, Ed. The Leslie Urquhart Press, Sussex, England. Vol. I, 1956. Vol. II, 1960. $16.50 per volume.

We have here the first two volumes of a monograph done in the tradition of the "Great Flower Books" of the eighteenth century and the first half of the nineteenth century, that is, accurate reproduction of the subject combined with the best possible decorative arrangement on the page. The superb life-size paintings by Paul Jones and Raymond Booth are reproduced in eight-color litho-offset on the finest hand-made paper. The eminently readable and authoritive text contains notes on each of the plants. Volume I is given over mostly to *Camellia japonica* cultivars, while Volume II features the first fine artist's paintings of the magnificent "Yunnan Reticulatas." Volume I is nearly exhausted, the publishers report, and is already being spoken of as a rare book.

The paintings are available separately in unbound sets. CHARLES C. CLARE, JR.

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